ELECTRICAL REVIEW

[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

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The Complete Phonograph.

The REVIEW presents its readers this week a view of the finished phonograph, as it will appear when in general use. This is the first illustration of the perfect commercial phonograph that has been published, the instrument being the result of the most careful work of Mr. Thomas A. Edison, and his associate, Mr. E. T. Gilliland. It occupies a space of less than two feet in length and six inches in width, the very efficient little electric motor being contained in the box beneath. A small battery—a battery that has been perfected to the satisfaction of the above-named electricians—and that is saying a good deal—is connected with the motor, and is estimated will last for six months, the one now in use at the laboratory having as yet given no indications of deterioration, although it has been in constant daily use for several months. We mention the battery and electric motor to show how carefully and comprehensively these valuable adjuncts to the proper working of the phonograph have been worked out.

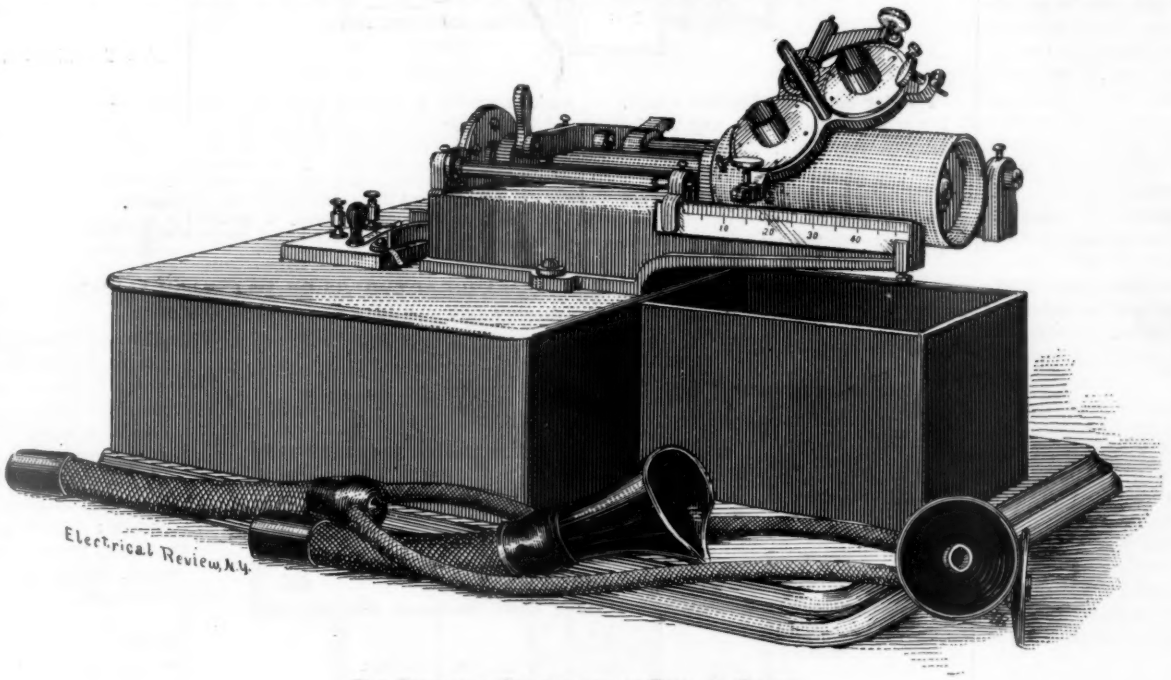
The phonograph has been described in these columns before, and needs no lengthy notice here. It was tested by the writer last week, who was convinced that the claims that have gone forth as to what it could do practically in the way of recording and *re-speaking* speech are fully substantiated. The idea one receives with the double ear-phone on—one will do very well, but two increases the volume of sound—is that some one is *in his ear* talking to him, every word coming clearly and with full sound. The day the writer tested the instrument, General T. T. Eckert, general manager of the Western Union, made a trial of its workings, and even his long and varied career among the astonishing things that electrical men invent did not prevent him from being greatly surprised at the phonograph, which so promptly and distinctly uttered back to him all that was spoken into it.

When the phonograph was first invented, the main idea was to secure loudness, a natural result of the numerous public exhibitions that were being made. Later work has been in the line of accuracy and clearness—results which have been attained to perfection.

Judging the phonograph from the point of its commercial use, there cannot fail to be a great field for it. The typewriter can use both hands in copying from it, controlling its operation by her foot, should she desire a sentence repeated. No foreign noises interfere with the recording of the speaker's words. Its adjustment is simple, and not at all sensitive—not near so delicate as the telephone transmitter.

The illustration shows the speaking tube, to be seen at the bottom of the box, which slips on to the small copper socket of the phonograph devoted to recording (shown directly above the scale), and also shows the double earphone, which fits down over the speaking, or rather re-speaking, part. The change from recording to "talking back" is instantly made, every instrument being a complete recording and talking machine. The phonograph has one instrument for talking into to make the phonogram and another to reproduce the speech; both are fixed to a swinging plate or turntable, as will be seen, and set with guides so as to overhang the phonogram spindle. To change from talking to reproducing, or *vice versa*, requires only to swing the carrier-plate into proper position and set back the carriage to the desired point.

The first public exhibition of the phonograph will be given at the Electric Club in about three weeks, at which time a special meeting of the members will be held. Mr. E. T. Gilliland will deliver an address, taking the phonograph and its history as the topic, and a number of the instruments will be at the club rooms that night, so all the members who are interested may personally try them.



THE PERFECTED PHONOGRAPH OF THOS. A. EDISON.

* * Mrs. Abbie W. Marsh, of Cleveland, has brought suit to obtain $3,750, which she claims was obtained from her under false pretenses by one Chauncey W. Mead. The defendant claims he can produce electricity from a chemical compound in great quantities. We are sorry for Mrs. Marsh—a primary battery shark has evidently captured her and her money.

THE EDISON CONVENTION.

FULL REPORT OF THE MEETING OF THE REPRESENTATIVES OF THIS COMPANY IN CHICAGO.

The association of Edison Illuminating Companies convened at the Grand Pacific Hotel, Chicago, on the 8th inst., with the following representatives of the system present:

T. A. Edison.
E. H. Johnson, Pres. Ed. Elec. Lt. Co., N. Y.; J. W. McClement, Controller, do.; J. H. Vail, Gen. Supt., do.; L. Steiringer, Expert, do.; W. J. Jenks, Director Standardizing Bureau, do.; C. R. Dean, Sec. Standardizing Bureau, do.
F. R. Upton, Treas. Ed. Lamp Co., Harrison, N. J; J. W. Howell, Electrician, do.; F. E. Jackson, Asst. Electrician, do.; B. F. Card, Agt., do.
L. Bergmann, Treas. Bergmann & Co., N. Y.
Geo. Peck, Pres. Ed. Ill. Co., Detroit, Mich.; E. W. Voigt, Vice-Pres, do.; C. P. Gilbert, Sec. and Man.; J. R. McLaughlin, Director, do.
C. L. Edgar, Gen. Supt. Ed. Ill. Co., Boston, Mass.
E. R. Weeks, Gen. Man. Ed. Ill. Co., Kansas City, Mo.
Chas. R. Price, Treas. Ed. Ill. Co, New Bedford, Mass.
E. Z. Wallower, Pres. Ed. Ill. Co., Harrisburg, Pa.
M. N. Grant, Pres. E. I. Co., Laramee, N. Y.; R. M. Jones, Sec. and Man.
W. M. Mottram, Supt. E. I. Co., New Orleans, La.
Chas. Weistenfeld, Man. E. I. Co., Elgin, Ill.
J. R. Markle, Markle Engineering Co.
John I. Beggs, Vice-Pres. and Gen. Man. Ed. I. Co., N. Y.
A. T. Seeburger, Pres. Ed. Ill. Co., Chicago. Ill.; F. S. Gordon, Sec. and Treas.; Arthur Hurtley, Asst. Sec.; D. H. Lauderbach.
F. D. Smith, Man. E. I. Co., Pontiac, Mich.
W. F. Wollin, Man. E. I. Co., Lancaster, Pa.
W. W. King, Supt. E I. Co., Topeka, Kan.
Thos. P. Merritt, Pres. E. I. Co., Reading, Pa.
Geo. W. Carter, Sec. E. Ill. Co., Jackson, Mich.; J. C. Wilson, Supt.; C. W. Fowler.
B. K. Jamieson, Vice-Pres. E. I. Co., Philadelphia, Pa.; W. D. Marks, Supt. and Eng.
J. E. Parrish, Supt. E. I Co., Scranton, Pa.
Danl. McCoy, Pres. E. I. Co., Grand Rapids, Mich.; C. W. Ayer, Sec. and Treas.; J. W. Crosby, Supt.
G. P. Denis, Pres. E. I. Co., Chester Pa.
C. H. Lindenberg, Pres. Ed. Ill. Co., Columbus, O; Will C. Munroe Man.
H. K. McCay, Supt. E. I. Co., Birmingham, Ala.
E. S. Bentley, Sec. and Treas. E. I. Co., La Crosse, Wis.; W. D. Kurz, Supt.
A. L. Smith, Pres. E. I. Co., Appleton, Wis.; F. G. Kurz, Supt.
B. B. Powell, Man. E. I. Co., Sault Ste Marie, Mich
Wilson S. Howell, Elect. E. I. Co., Williamsport, Pa.
W. E. Carlin, E. I. Co., Jerseyville, Ill.
H. Ward Leonard, of Leonard & Izard, contractors, Chicago, Ill.
C. E. Chinnock, Vice-Pres. Edison United Mfg. Co., N. Y.
Saml. Insull, Gen. Man. Ed. Machine Works, Schenectady, N. Y.
C. M. Barclay, Vice-Pres. E. I. Co., Oskaloosa, Iowa.
W. Oswald, Agent E. United Mfg. Co., New Orleans, La.
W. D. MacQuesten, Western Elec. Constn. Co, Kansas City, Mo.
H. McL. Harding, General Manager Sprague, Elec. Ry. and Motor Co, N. Y.
J. F. Smathern, Man. E. I. Co., Baraboo, Wis.

The officers of the association are:

Jno. I. Beggs, President.
J. H. Vail, Secretary.
W. S. Howell, Treasurer.

Two Electric Light Conventions are held semi-annually in the United States, one of which may be compared to an omnibus, in which all electric light systems may be represented; the other a single-seated buggy, in which a single company is the sole occupant. The latter is the Edison Association, and in the meetings of this organization no arc light and no other form of incandescent system is represented. The papers read, the experiences given, all tend in one direction, are all especially adapted to and fitted for the use of the various Edison systems.

The first morning session of the association, which was called to order at 10.30, was almost exclusively one of organization and an experience meeting. The rule of exclusiveness was rigidly enforced, and neither outside electrical people nor newspaper representatives were admitted.

At the afternoon session papers were read by Mr. J. H. Vail and W. J. Jenks, the former general superintendent of the parent company, and the latter director of the Standardizing Bureau.

A meager abstract of the interesting paper by Mr. Jenks on "Incandescent Lighting by High Potentials" is apropos at this time

(*Continued on page 5.*)

New Physical Laboratory—University of Michigan.

The facilities for instruction in physics at the University of Michigan have long been inferior to those offered in other departments. This deficiency was brought to the attention of the last Legislature, and appropriations were made, both for large additions to the apparatus and for a new building for a physical laboratory, which is now in process of construction. The plans of the building and the purposes of the department are of interest to electricians, because of the large provision made for instruction in electricity on a commercial scale.

The basement and first-floor plans will indicate clearly the general arrangement of rooms. The greatest dimensions are 72x115 feet. The main entrance is on the north side and a descent of five steps leads to the basement floor, which will be only two feet below grade. The basement rooms are eleven feet high and are nearly all devoted to electricity. Steam will be brought from the new boiler house in the vicinity, both for heating and for power. It is proposed to place in the engine room a fifteen horse power engine of the best make, for the exclusive use of the department. Piers in abundance are provided for instruments, and the west end of the building will be kept nearly free from iron. On the first floor provision has been made for a large extent of slate tables, supported on stone corbels set in the walls. The floors are of very unusual stability, having 3x12 and 3x14 inch floor joists, with centers a foot apart and strongly bridged. A diagonal under floor of matched pine will be covered with one of narrow maple. All the partitions in the basement, and all but one on the first floor, are of brick; all of these, as well as the outer walls, are finished in brick with struck joints. The lecture room will seat comfortably one hundred and twenty-five persons, and will be arranged for darkening on the most recent and approved plans.

It is proposed to place a storage battery in the battery room both for experimental purposes and for lighting the building. Dynamos and motors of various types will be provided. Some of the best instruments of English and German make, for measuring resistance, current and potential, have already been procured.

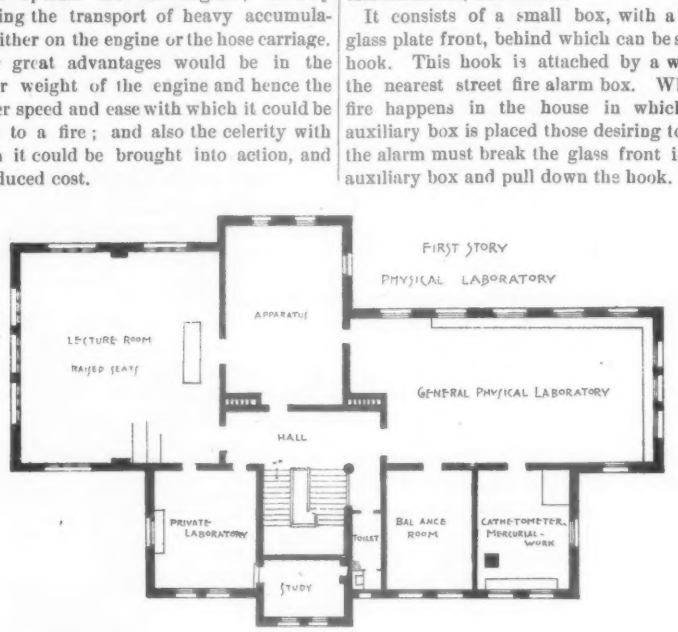
While the other branches of physics will not be neglected, special attention will be given to electricity and magnetism, in connection with the department of mechanical engineering. The new building for this department is nearly completed and is already in use. Here additional power can be obtained when needed, either from a thirty-five horse power Corliss engine or a twenty-five horse power automatic engine built by the department for special experimental purposes.

The building will be ready for use by Oct. 1st, and it is then proposed to offer to students in mechanical engineering special courses in electrical work during their last year, which shall lead to the degree of electrical engineer. Since the electrical engineer is in large part a mechanical engineer, students in the University will have ample facilities to secure just such instruction, laboratory practice and shop work as are needed to fit them for a professional career in applied electricity. Such students will find open to them all the advantages in language, mathematics, chemistry and physics that the University offers; and they should be stimulated in the pursuit of their professional studies by the knowledge that the University has had under its tuition in past years two men whose names are now so distinguished in applied electricity—Mr. Charles F. Brush and Prof. Amos E. Dolbear—the one as an under-graduate and the other as a post-graduate student.

This plan of providing technical courses in our leading universities, instead of establishing schools for each specialty, is to be commended on the score of economy, and particularly because of the extensive and varied advantages which such an institution affords.

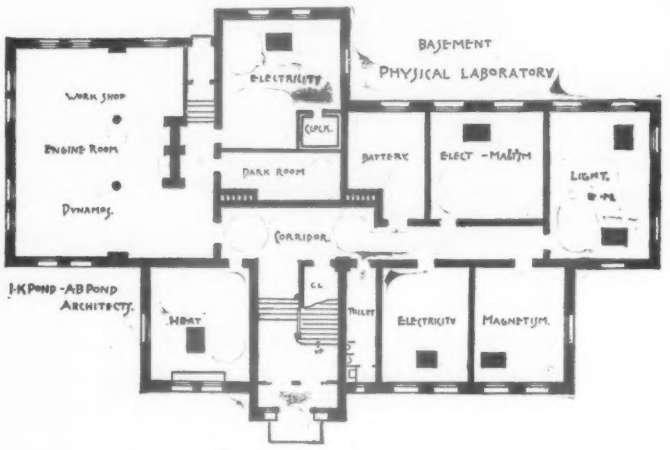
Fire Engines Operated by Electricity.

A great improvement in the handling and working of fire engines might be brought about by the application of electricity, says the *Jewelry News*. In fact, an engine can by such means be operated from a central station in the same manner as electric light is distributed over a large space or a city. While the pumps are being attached to the hydrants, the engineer may be attaching the connections of his motor to the proper wires, and the alarm having notified the central station, the electric current therefrom would operate the fire engines, entirely avoiding the transport of heavy accumulators either on the engine or the hose carriage. Other great advantages would be in the lighter weight of the engine and hence the greater speed and ease with which it could be taken to a fire; and also the celerity with which it could be brought into action, and its reduced cost.



The Spread of the Electric Light.

The progress made in the way of electric lighting is very rapid. It has spread in the Eastern States from the cities to the towns, and quite small villages, that have never indulged in gas, are preparing for electric plants. The cost is really a great deal less in a small town than gas would be, as the outlay is a trifle. Most of the towns in New England and New York have sufficient water



NEW PHYSICAL LABORATORY.—UNIVERSITY OF MICHIGAN.

power. In the prairie States the problem is not by any means as simple. The electric light is convenient for illuminating handsome grounds, and is being used for that purpose, so that places of several acres in extent are made very conspicuous and delightful. We are probably as yet only at the threshold of this movement. It is not impossible that in due time every country lane will be as brilliant as a city street by night.—*Boston Herald.*

* * The Central Electric Company, of Chicago, have accepted and placed upon that market a wire which, as a substitute for the ordinary painted wire, is a decided improvement; we refer to that manufactured by the Okonite Company, known also as the "Candee" wire. While this wire costs a trifle more than the "underwriter's," it is worth, for ordinary purposes, much more than the difference in cost.—*Ex.*

An Auxiliary Electric Fire Alarm.

A public and practical test of the Gamewell auxiliary fire alarm box, which was displayed before the Fire Commissioners lately, and fully explained in the *Press*, was made at the office of D. W. Baker & Co., platinum refiners, at the corner of Murray street and Railroad avenue. About fifty prominent Newarkers were present, including Mayor Haynes, Fire Commissioners De Vausney, Bannen and Provost, Jno. H. Kase, ex-Ald Westervelt, D. W. Baker, Chief Keiersted, Superintendent of Fire Alarms Bosch, and others.

It consists of a small box, with a small glass plate front, behind which can be seen a hook. This hook is attached by a wire to the nearest street fire alarm box. When a fire happens in the house in which the auxiliary box is placed those desiring to give the alarm must break the glass front in the auxiliary box and pull down the hook. If it works correctly a buzzing sound is heard and hook must be kept pulled down till the sound ceases. The operator then knows that an alarm has been sent out. If no buzzing sound is heard, then the box will not work, and an alarm must be given in the usual way. The alarm once given, a person must be sent to the nearest street box to direct the Fire Department responding to the location of the fire.

The usefulness of the auxiliary box was explained also. Often a considerable time elapses before a person, after discovering a fire, can obtain the key of the street box, and the time thus lost permits the flames to gain such headway that they cannot be checked, or at least until great damage is done. Again, a man on discovering a fire desires to fight it with the means at hand, and neglects to send out an alarm, which he would do if the means in the shape of an auxiliary alarm box was near by. A most successful test of the little invention was made with the box in Baker & Co.'s office. So soon as the glass had been broken and the hook pulled, a man started off to the nearest street box to which the wire was attached. So well had the little instrument done its work that by the time he reached the box, No. 10 engine had received the alarm and was on the spot, and was followed almost immediately by hook and ladder company No. 1. Those present were much pleased with the working and practical usefulness of the invention, and declared it a perfect success. The cost of placing a box in a store or dwelling house, and keeping it in order, was not stated, but it is understood to be somewhere in the neighborhood of $15 a year.—*Newark Press.*

The Excelsior Electric Light Company's Troubles.

To the Editor of Electrical Review:

Our attention has been called to an article in your issue of Feb. 4, 1888, entitled "A Receiver for the Excelsior Electric Company," in which you say: "In the suit of Attorney-General Taber, on the complaint of Henry D. Fuller, who owns 2,500 shares of the Excelsior Electric Company's stock, and alleges that the affairs have been fraudulently managed, Judge Andrews has appointed William Q. Judge, receiver. This is a Brooklyn company, and Mr. Geo. D. Allen, general manager, and Mr. Hochhausen, electrician and superintendent, are made defendants."

While it is true that we, the undersigned, are made co-defendants in said suit, happening to be members of the board of trustees against which the suit is directed, we beg to inform you that we are not in sympathy with the other directors of the company, against whom said charges were principally preferred, and that it was with our full consent and chiefly at our instigation, that such receiver was appointed to protect the interests of stockholders and creditors. The fact of being retained in our respective positions by the receiver, proves conclusively that nothing detrimental to the best interests of all concerned has been attempted by us. As the opinion of some of your many readers, acquainted with us, might have been biased by the insinuation contained in the article above referred to, we ask you to give this correction the same publicity as you have your article. Very respectfully,

GEORGE D. ALLEN,
W. HOCHHAUSEN.

New York, Feb. 7, 1888.

Electro-Motive Force of the Voltaic Arc.

In a previous abstract *Annalen der Physik und Chemie* gave the arrangement described by which the resistance of a circuit can be measured whilst a current circulates in it. Former experiments gave the value of 39 volts, and it seemed desirable to repeat them, using copper as well as carbon rods, and also replacing the lamps by compensating resistances.

The new experiments gave the value of 37 volts for the E.M.F. of the arc between two carbons 5 mm. in diameter. With copper rods of the same size the E.M.F. was found to be 27.6 volts, or 0.75 that of carbon, which agrees fairly with the mean value (0.86) found by Edlund. In all these experiments the length of the arc was kept constant; in others, the results of which are tabulated below, the length of arc was varied, and the E.M.F. was calculated from the formula

$$E = a + b\,l\,I,$$

in which a and b are constants, l is the length of the arc, and I the current.

	a	b	l	I
Rods.	Volts.	Ohms.	Mm.	Amperes.
Carbon	35.07±1.34	1.32±0.11	0.4 to 2.5	4.0 to 5.4
Platinum	27.41±1.16	1.49±0.19	0.3 " 3.2	0.3 " 5.5
Iron	25.03±2.16	0.70±0.06	0.5 " 3.5	2.6 " 5.9
Nickel	26.18±2.95	0.77±0.13	1.6 " 7.3	4.5
Copper	23.86±1.33	0.67±0.04	0.6 " 7.0	4.1 " 5.2
Silver	15.23±0.45	0.96±0.06	0.3 " 7.5	3.7 " 5.1
Zinc	19.86±2.27	0.56±0.38	0.5 " 4.0	2.6 " 4.3
Cadmium	10.28±3.38	2.56±1.27	0.4 " 1.7	2.5 " 3.5

The Velocity of Electricity.

There is, as Prof. Thompson remarks, no assignable "velocity of electricity," as this must vary with the current and the conductor. Wheatstone, in 1833, seemed to show a transmission velocity of 183,000 miles a second through copper wire, but in late experiments signals were sent over ordinary telegraph wires on poles, and had a rate of only 14,000 to 16,000 miles. With wires near the earth the velocity was 12,000 miles, but reached 24,000 on very high wires.

* * The Philadelphia Electrical Society, 1,912 Chestnut street, will listen to an address Feb. 18th, by Dr. G. Seiler, on "Electricity in Medicine," and on Saturday evening, Feb. 25th, to an address by C. M. Knapp, on "Electrical Measurements."

The Korting Gas Engine for Electric Lighting.

The latest form of the Korting gas engine has many points of interest and merit in simplicity and convenience, as an inspection of the illustrations will show. Valves are accessible, and can be removed, cleaned and replaced by any one without derangement. All adjustments are quickly and easily made. One of its most important features is the governor, which is shown on an enlarged scale in the illustrations.

The leading features of the governor are two independent movements derived from the main shaft. The first is for uniformly opening the exhaust valve ; the second is influenced by the speed, and varies the time of closing this valve. It is easy to understand that the power of the engine may be influenced by the length of time the exhaust valve is kept open during the return stroke of the piston ; the earlier the valve is closed the larger the quantity of the products of combustion retained in the cylinder, and the smaller the amount of fresh gases required to again fill the cylinder, to secure uniform compression and a combustible mixture for the next working stroke of the engine. Thus the minimum power is secured by retaining in the cylinder the larger portion of residuum, and taking in the smallest amount of fresh gases, and the maximum of power by expelling the greater portion of the residuum and again filling the cylinder with fresh gases. Between these two extremes all medium degrees of power are secured by the action of the governor closing the exhaust valve at various points between the two extremes of the stroke of the piston. This system of governing is, we believe, peculiar to the Korting gas engine.

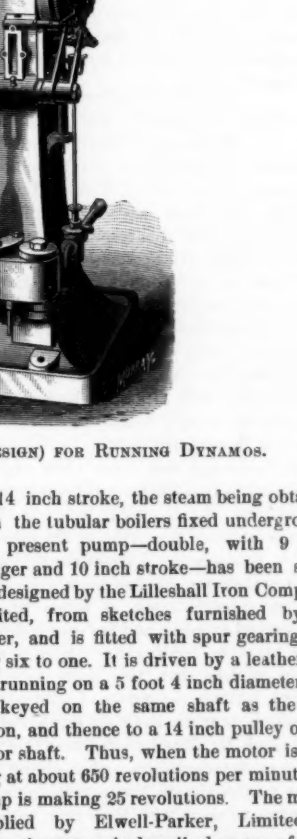


Fig. 2.—The New Korting Governor.

Electricity to Replace Servants.

We British are fond of having a number of servants in attendance when we dine. Flunkeys with us are supposed to have ears that hear not, and eyes that see not, what their employers say and do. It would be impossible to suppose anything of the sort in Paris. Masters and mistresses dread the criticisms of the servants' hall, and their highest idea of dining-room comfort is to be served by machinery. The dinner-lift came into fashion in the reign of Louis XV. Electricity is now being used to enable persons of wealth at *diners intimes* to do without the waiter or the *maitre d'hotel*. A miniature railway is laid down on the dinner-table and continued on the same level into the kitchen through an aperture in the wall and an intermediate pantry. Dishes come in, and, after making the round of the table, go out in a sort of small truck moved by electricity. The truck at any moment can be made to stop. It does its work admirably as a dumb-waiter, and any amount of art can be lavished on it to give it a decorative beauty.—*Paris Letter to London Truth.*

The Edison System is Used.

To the Editor of Electrical Review :

Noticing in a late issue of the Review a carefully arranged table of the results of the lighting of the Kansas State Penitentiary by incandescent electric lamps, I think, as one specially interested in the progress of this branch of electrical work, there may be many of your readers who would be glad to know what system is used in this institution.

Geo. E. Phillips.

Albany, N. Y., Feb. 6, 1888.

—— The excellent quality of the vulcanized rubber belting manufactured by the New York Belting and Packing Company, 15 Park Row, New York, for use in all lines of manufacture, is becoming more apparent daily. This company, who are the oldest and largest manufacturers of vulcanized rubber goods for mechanical purposes in the United States, have lately placed upon the market a superior quality of belting, with smooth metallic surface, for electric light purposes. The adhesive properties of this belting enable it to cling closely to the pulley or wheel on which it is used, which prevents slipping. It is especially adapted for use on dynamos and other swift-running machinery.

Electric Pumping in Collieries.

By Frank Brain.

Before electricity is adopted by practical mining engineers, they must be convinced that it can compete economically with other modes of transmitting energy—modes which are well known and generally applied. What percentage of indicated steam power applied to the generating electric machine is given off ultimately as available energy for mechanical work? How does it compare as to cost? Under what circumstances would its application be economical? If leading main questions such as these can be plainly and satisfactorily answered, practical men will not be long in arriving at a favorable opinion and acting upon it. The application of electricity to underground pumping has enabled the writer to tabulate some particulars which he believes will go a long way towards satisfying inquirers that this is a method of transmitting energy capable of wide and economical adaptation.

Some four years ago Mr. W. B. Brain described to this Institute, in a short paper, a small electric pumping plant at Trafalgar Colliery, Forest of Dean, doing the work of about 1¼ horse power. This, the writer believes, was the first attempt ever made at pumping in mines by electricity. It has continued working satisfactorily up to the present time. A similar set, using about 2½ horse power, has been working in another part of the mine, some 800 yards from the surface, for the past eighteen months. Both are doing excellent service, removing small quantities of water from remote parts of abandoned workings, which for the safe working of the colliery must be kept free from accumulations of water. It may be well to say that the majority of the collieries in the "Forest of Dean" have their shafts sunk on the "rise" of the taking, and the coal is won by "dipples" or engine planes going full dip with the strata. The outcrop is riddled with old abandoned workings. These receive a great quantity of surface water, which finds its way down the slope of the strata to the deeper workings now in operation. The two electric pumps above referred to intercept some of this water on its downward course. The electrical pumping plant which the writer proposes describing in this paper has been put in to deal with the main flow of water in the deep workings of the Trafalgar Colliery. The pump and motor are placed at a distance of about 1,650 yards from the bottom of the shafts, and the water has to be forced by this pump a vertical height of 300 feet to the pit bottom. This water had, previous to May last, been coped with by one of Hathorn Davey's water power pumps, working in conjunction with 7 inch double plunger "Manchester" Pearn pump with 10 inch steam cylinders and 14 inch stroke, the steam being obtained from the tubular boilers fixed underground. The present pump—double, with 9 inch plunger and 10 inch stroke—has been specially designed by the Lilleshall Iron Company, Limited, from sketches furnished by the writer, and is fitted with spur gearing running six to one. It is driven by a leather link belt running on a 5 foot 4 inch diameter pulley keyed on the same shaft as the spur pinion, and thence to a 14 inch pulley on the motor shaft. Thus, when the motor is running at about 650 revolutions per minute the pump is making 25 revolutions. The motor, supplied by Elwell-Parker, Limited, of Wolverhampton, is described as one of their 12 inch machines—maximum speed about 650 revolutions per minute, output about 13,000 watts. The electric current is conveyed to it by a copper cable 2,000 yards long, $\frac{19}{20}$ wire, wrapped with compounded tape, and was supplied by the India-Rubber, Gutta-Percha, and Telegraph Works Company, Limited, Silvertown. This is enclosed in wooden boxes in the pit shaft only. It is supported upon earthenware insulators placed at intervals of about 10 yards along the side of the underground roads. The return cable is an old iron pit rope about 4 inches in circumference, stapled to the road posts. The generator, placed on the surface near the top of the shaft, is another of Elwell-Parker's 12 inch machines. Its maximum speed is about 950 revolutions per minute, and output 17,000 watts. A belt communicates the power through a 12-inch pulley on the generator from a 5 foot 11 inch pulley attached to the crank shaft of an engine. The steam engine has a single 16 inch cylinder, with 12 inch stroke, and works with about 35 pounds steam pressure. It is an old marine engine, picked up some time since at an auction sale, and is not what one would purchase new for the work. It showed an indicated loss running empty of 5 horse power, the valves and piston being both the worse for wear. In the same engine house is another engine, which supplies the power for the two small electric pumps previously referred to. The steam for both is obtained from the range of colliery boilers near at hand. A small insulated copper wire connected with a battery of eight No. 3 Leclanche cells, connects the engine house with the pump house underground, and through this is registered upon a belt in the former each stroke of the pump. It is also used as a telephone line, so that a conversation can at any time be carried on between the engineman on the surface and the man in charge of the pump underground. The two smaller pumps are locked up without any one in charge, and are only visited occasionally; but with the larger one an attendant is thought necessary, although there is rarely anything more to be done than oil the machinery, adjust the machine brushes and turn on the current. Near the engines are the necessary electrical instruments. A voltmeter and an ammeter are placed by which the engineman is made aware that the machines and cables are working properly. A magnetic cut-out is also placed in the main circuit, so that, should the current, through any unforeseen cause, increase, the cut-out automatically breaks the circuit, and thus prevents the flow of electricity through the cables. The maximum speed at which the pump has been driven is 25 strokes (114 gallons) per minute. The observations taken at the time were: Indicated horse power of steam engine, 20.49; speed of generator, 900; volts (at terminals of generator) 320; amperes (at terminals of generator), 43; speed of motor, 650; volts (at terminals of motor), 260; amperes (at terminals of motor), 43; actual horse power of water lifted, 10.36.

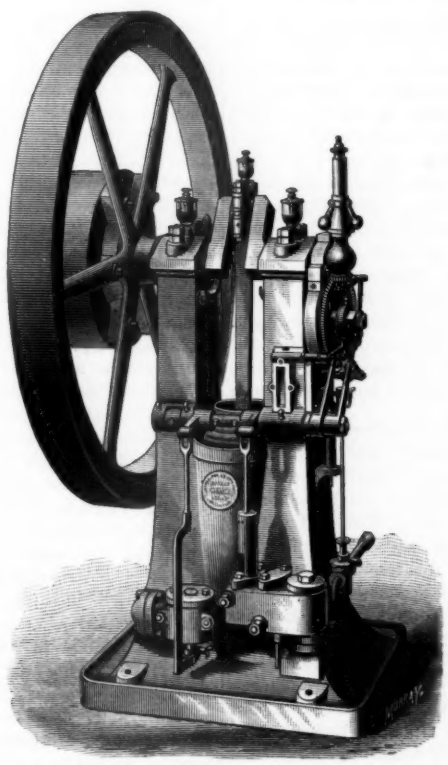


Fig. 1.—Korting Gas Engine (New Design) for Running Dynamos.

The total loss of power is 19.3 horse power, apportioned thus: Loss in engine, 6.49 horse power, or 22 per cent.; loss in generator, 4.56 horse power, or 16 per cent.; loss in line, 3.45 horse power, or 11 per cent.; loss in motor, 3.00 horse power, or 10 per cent. loss in pump, 1.63 horse power, or 6 per cent.

The actual proportion of power given off by steam engine used to lift water is therefore 35 per cent. The diagram, Fig. 5, shows the percentage of useful effect extracted from the power received at each stage, together with the percentage of loss, was as follows:

Horse power indicated by steam engine.....29.49

Received by		Loss in	Per cent.	Useful Effect Per cent.
Generator	23.00 h. p.	Steam engine	22	78
Cables	18.44 "	....Generator	20	80
Motor	14.99 "	..... Cables	20	80
Pump	11.94 "	.. .... Motor	20 ...	80
Water	10.36 "	..... Pump	14	86

The loss between the power given off at the belt of the steam engine and the actual work done, thus :

Horse power given off to generator..... 23.00
Loss in generator..... 4.56 h. p. or 20 per cent.
Loss in cables ..... 3.45 " " 15 "
Loss in motor..... 3.00 " " 13 "
Loss in pump..... 1.63 " " 7 "
Total loss..... 55 per cent.

* * The pumps at St. John's colliery, Normanton, Eng., are worked by an electric motor.

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EDITORIAL ANNOUNCEMENT.

Address all communications and make all Express Money orders, P. O. orders and checks, payable to order of ELECTRICAL REVIEW, P. O. Box 3329, New York.

We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

Mr. C. C. Haskins, 118 LaSalle Street, Chicago, Ill., will represent the REVIEW in the West
Messrs. Wm. Dawson & Sons, 121 Cannon Street, London, England, are our representatives for Great Britain.

NEW YORK, FEBRUARY 18, 1888.

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"Are you going to Pittsburgh next week?"
"Yes, of course; everybody is going to Pittsburgh."

A bill regulating telephone rentals has been introduced in the Kentucky legislature by Hon. John McCann. It is very similar to the Indiana bill that proved so disastrous to both subscribers and telephone companies in that State.

Mr. E. R. Weeks, First Vice-President of the National Electric Light Association, is visiting in New York this week, with headquarters at the Electric Club. He has been attending the Edison Convention in Chicago, and will take a run over to Boston, returning in time for the Pittsburgh Convention.

The formal opening of the Electric Club's new house was a source of much interesting news for the newspapers of the country. In addition to the comprehensive account sent out by the Associated and United Press, a number of the wide-awake, enterprising journals in Boston, Philadelphia, St. Louis and Chicago published special telegraphic accounts. The interest in the progress of electricity is ever increasing.

The perfected phonograph, about which so much has been said, is illustrated in the REVIEW this week. Although the work of an eminent electrician, electricity was not originally an element in its use; but to make it practically successful the electric current has been found essential, and is to-day a most conspicuous factor—in fact, will prove, we think, the link that connects the toy phonograph with the commercially valuable instrument.

Pathologically considered, the electric current has been and is doing a vast amount of good, and physicians of the highest repute do not to-day consider themselves fully provided with the quota of their requisites until they have a standard set of instruments. Electricity is by them applied to nervous disorders, and by surgeons in cautery to great advantage. But why not go a step farther? It is a fact that, properly applied, the electric current effectually destroys all disease germs in impure water Then why not destroy similar germs and organisms in cellular pathology? Why not apply this attribute to the extinction of all cancerous growths and skin or tissue diseases? There is room in the suggestion for much interesting experiment. We do not mean electro-cautery, but the application of what we may term electrolysis to organic life, and its resolution into its harmless elements.

A WORD OF MERITED PRAISE.

Mr. J. F. Morrison, of Baltimore, positively declines to again be a candidate for the presidency of the National Electric Light Association. For three years, since its organization, he has held this responsible and honorable position. His declination removes the chief spirit in an administration that has been strong, comprehensive, and unique. A man of pronounced executive ability, of strong parts, with enough of the politician to understand motives and handle men, Mr. Morrison was well fitted to take the chaotic and quite often sadly ignorant elements that composed the electric lighting constituency of three years ago, and from these organize an association that has been of great influence in advancing the electrical interests of the country—at once the pride of the president and his monument. In matters pertaining to the association he has been a loyal and unselfish worker, often at much personal sacrifice and expense, and has seen it develop under his able guiding hand from a membership of less than two score to several hundred, while in the matter of influence and instruction its work has been incalculable.

We think Mr. Morrison deserves this word of honorable recognition, and in giving it we do not underestimate the several able and valiant co-workers who have been with him on the Executive Committee, whose counsel has been valuable and whose discerning efforts have been ever for the advancement of the best interests of the electric lighting industry.

POSSIBILITY OF IGNITION FROM INCANDESCENT LAMP FILAMENTS.

When incandescent illumination was first introduced it was generally assumed that the method of environing the source of light from all contact with surrounding objects, coupled with the fact that in case of breakage of the lamp bulb, the light was extinguished by the apparently instantaneous consumption of the filament, gave rise to the feeling that such a form of illumination was absolutely free from the possibilty of starting ignition.

In fact, one very youthful agent of an incandescent electric company said to an insurance officer of mature years, in accordance with instructions: "Our system is absolutely safe and cannot set a fire." The veteran underwriter said: "Our experience is proof of hazard in everything, from the sun above to the earth beneath, and the waters under the earth; for there is not a natural element, a raw material, a process of manufacturing, or any mechanical or chemical process in actual industrial use, which has not proven a source of fire."

Leaving out of the question all possible dangers, although under the present safeguards their conditions are so remote as almost to deserve cancellation from among the facts which enter into the insuranee problem, the question is frequently asked: Is there any possibility of ignition proceeding from the incandescent lamp filament? Many persons have assumed to set the matter at rest in the way that one of the employes in a printing office, which was illuminated by incandescent lights, declared that they could not set a fire, because he had tried to light his pipe from all sides of them, and he might as well have tried the water faucet as that lamp.

A number of years ago incandescent lamps were broken in contact with powder without exploding the powder, but shortly after the writer broke incandescent lamps when in circuit, enveloped in cotton, and succeeded in setting the cotton afire in the majority of cases, though not in every instance.

At the coroner's inquest after the Temple Theater fire, in Philadelphia, last year, one of the witnesses succeeded in igniting light tissue paper placed around incandescent lamps, which were then crushed.

But neither of these experiments was, as far as existing precedent is concerned, to be considered as a measure of their behavior under conditions of hazard, because lamps are not kept either in shreds of tissue paper or in cotton, and there is no other source of artificial illumination to which any one would contemplate applying these tests. But the extreme safety of incandescent illumination is of such a nature as to become a perpetual challenge with gauntlet thrown, ready for anyone who would break down the bulwark of its safety.

A short time ago it was desired to introduce illumination in certain portions of a rubber works, where the amount of naphtha used in the process filled the air with so much vapor that it was never found feasible to prolong the working hours beyond the hours of daylight; a great hindrance to the business during the short days in winter. In order to test the adaptability of incandescent illumination for the purpose, a quantity of naphtha was placed in a barrel, and an incandescent lamp in circuit let down into the barrel, so placed that a small weight could be dropped upon it and shiver the glass. In this manner about twenty lamps were broken without any of them igniting the vapor.

Yet this experiment cannot be regarded as conclusive, because it lacked some of the elements which would furnish all the facts necessary to the complete consideration of the case. For if a sufficient amount of naphtha had volatilized to have filled the lower part of the barrel with the vapor of naphtha, to the exclusion of the air, the contents would not have been combustible in the presence of a momentary spark at that point. A truer test of the conditions would have been to have filled some vessel like a small cask, mouth downward over water, and by means of any convenient apparatus for crushing the lamp, have broken it in the presence of a mixture of gas or naphtha vapor, and air, in proportions known to be explosive. We believe that, under such conditions, the gas would be exploded in the event of the breakage of the lamp

But this condition of affairs by no means serves to prevent the use of incandescent lamps for illuminating such dangerous processes. For, as is well-known, that installations in such places are arranged to render each lamp doubly secure beyond peradventure, by surrounding it with a double globe of very heavy glass, and, in one instance the space between the protecting glass and the incandescent lamp bulb was filled with water, a precaution which hardly appears to be essential, as we believe that the presence of air between the two globes would serve a useful purpose in furnishing a supply of oxygen to consume the lamp filament in case of any accident befalling the inner and outer globe.

It is for positions like this that incandescent illumination can be operated under conditions of safety comparable with no other method of artificial lighting, and in this way it has filled a position of value and utility, which cannot be measured by its cost.

OUR CHICAGO LETTER.

From a Special Correspondent of the ELECTRICAL REVIEW.)

E. B. Chandler, general Western agent of the Gamewell F. A. T. Company, has recently returned from Janesville, Wis., where he completed the city's fire alarm, and gave a public test of its efficiency. Every electrician knows that with the non-interference attachment, or, rather, arrangement of the Gamewell system, it is practically impossible to make two boxes interfere. This always looks like a statement requiring proof at every new installation. Following the custom, two watches were set precisely alike, and their owners agreed on the exact second when they were to pull two boxes simultaneously, and confound Chandler. After two attempts Mr. C. was declared winner, and the plant accepted. That kind of test has no terrors for the Gamewell people, for they have been through the mill too many times.

The event of the week has been the semi-annual meeting of the Edison Electric Illuminating Companies Association at the Grand Pacific. Inasmuch as this association is a close-communion one, and very close at that, an electrical newspaper representative had very little show of learning anything that was going on. Two or three of that class managed to get into the hall just after the "ayes" which always follow a motion to adjourn, but it was like looking for wheat at the tail of a threshing machine, to hunt for information. There were, it is true, piles of paper and printed pamphlets on the table, and the secretary's notes in shorthand. Jenks hadn't time to tell a body anything, and Vail had a prior engagement, and Stieringer was thinking of something away off in Jones's plant in Laramie, and Thomas Alva was only here for fun, and was so deaf he hadn't heard a word, and somebody else, perhaps it was Weeks, or it might have been Harding, suggested that when any outside help was needed to run what was virtually a meeting of a board of directors, such help would probably be asked for. It wasn't done in an ungentlemanly manner—far from it—but the weather was quite frigid while the convention was in session, and it was particularly cold weather for interviewers and newspaper men.

All delegates who will arrive in Chicago, bound for the Pittsburgh Convention on the 20th instant, are invited to make the club rooms their headquarters and rallying point that day. Two objects are to be accomplished—lunching, and getting acquainted. Cushing, Shain, Kreidler, Terry, Haskins, Johnson, Stewart, Bailey, Horne and Buckley comprise the committee of entertainment.

A special car will leave the Pennsylvania depot, Madison and Canal, attached either to the 3.15 or the 5.00 P. M. train, on the 20th.

C. C. H.

Chicago, Feb. 13, 1888.

EDISON CONVENTION.

(*Continued from page* 1.)

when such herculean efforts are being put forth to introduce systems of incandescent lighting at material distances from the source of power.

He referred to the satisfaction with which the results of early experiments were received, and spoke of the resulting massing of dynamos in series in order to accomplish an increased lighting capacity, until, in some instances named, circuits of 15 to 25 miles were being operated, with a capacity for 120 arc lights, with one of the most vicious forms of arc dynamo. This sort of carelessness resulted in breaking down the insulation of conductors.

Marcel Deprez, in some of his long distance experiments, called to his aid still higher potentials, and even speculated upon the use of 20,000 to 30,000 volts, in endeavoring, as far as possible, to practically annihilate distance.

Enthusiastic speakers on one occasion had outlined the easy transmission of the enormous energy of Niagara to New York, as well as other points equally far away—involving a right of way for conductors so fraught with danger that a dead-line must needs be drawn, over which none must pass—a proposition which had only created in conservative minds amusement and distrust. Electricity, while the most potent of all forces of the universe, and in general subservient to the will of man, like all other forms of energy, is ever ready to escape from human control.

There is a radical difference between transmitting energy from point to point, on the one hand, and distributing energy from some center or reservoir on the other. In transmission, thus understood, we may use high potentials in any department of applied mechanics. In constructing the foundation of the East River bridge it became necessary to transmit gas under a pressure of 45 pounds to the square inch—a fact unprecedented in the history of the industry, and utterly impracticable except for specific uses, in connection with proper reducers in distribution, and under the watch and care of competent engineers. A system is now being introduced in New York, using high pressure, with reducers at the house service. The same principle is made available in the oil pipe-line systems of transportation. It is safe to say that the mechanical pressures thus developed are as difficult of control as electrical pressures which we describe as high E.M.F. Specially devised threads and couplings are resorted to by constructors of such appliances, as we are compelled to resort to high insulations to counteract electrical pressures.

The same principle of high potential is shown in water leads where mining is carried on, and in locomotive engineering as well. Yet, while these, in competent hands, are perfectly safe and useful, it would be extremely hazardous for a mining engineer to carry into his residence a service from the hydraulic system with which he tears away the side of a mountain, or for the locomotive engineer to trust his domestics with a pressure equal to that in his boiler, for heating purposes.

Within proper limits, the principle of high pressures is not absurd or inconsistent with correct principles of future progress. The idea underlying the transformer is the logical outcome of experience, but thus far we have no satisfactory application to general commercial uses, excepting, possibly, through the electric motor.

Certain underlying laws of electrical distribution at safe pressure are now known to have been clearly and sharply defined to Mr. Edison's searching scrutiny at an early day, as evidenced to us all in the patent applied for in 1880, and issued to him since our last meeting. Yet we are confronted in the business of electric lighting even to-day by statements of interested parties, that perfect control has been established over electrical energy, when sent out from the dynamo at high pressures by which—sometimes merely by subdivision of current into several small units, at other times by a reduction of its pressure by some system of inductive action—the dangerous current of the dynamo is supposed to be reduced to harmless conditions at the lamps.

The only end accomplished by all these appliances is a saving in the amount of copper used, while the danger is in no ways avoided. The assertion was made by the reader that the majority of arc light superintendents do not know by actual watching and testing how much of energy their plant is wasting through leaks and overcoming the resistance in copper.

It is becoming known to-day that lines of 15 or 20 miles, though supplied with current at pressure of two thousand to three thousand volts, really absorb a portion of that energy. The systems of distributing boxes and other devices for incandescent service are falling into disrepute, and yet incandescent lighting is to-day more popular than ever, and the transformer or converter is looked upon by the more careful and earnest inspectors as belonging to the same class as other distributors which have gone to their graves before them. While these are in perfect condition, the transformer circuits are capable of being manipulated with comparative ease, but even then there is a material loss of energy which develops in the form of heat. With a water-tight converter case the radiation is slow, and the heat is concentrated largely in the coils. The insulation must become affected in time. Ventilation means admission of damp air; this means disintigration, and a breaking down the insulating barrier between the two circuits. This last may result in the formation of an arc, or heat may develop into a conflagration. Even an explosion may occur from the volatilization of the copper. The danger too from such a contact in the converter, extends to the lamps in the secondary circuit, and these are ever sources of peril to whomsoever touches one of them by forming a ground contact. The safety fuse is the only protection to an incandescent, as insulation is the only safeguard in the arc plant.

While the systems referred to are objectionable in many respects, and particularly for domestic illumination, there is a system by which a reasonably high pressure may be utilized without requiring either a reducer or alternate impulses for long distance, out of door lighting, where safety is insured because of the inability of the citizen to reach the lamps.

Where the breaking of such a circuit occurs in the open air from any cause, the only harm which can arise is that resulting from the extinguishment of the lamps in the circuit. Where lamps on such circuits are used for interior illumination, an accidental separation of a wire, by setting up an arc, might be productive of much damage.

A modification of the Edison three-wire system was mentioned by the reader, where two Edison 600 volt, 26 ampere dynamos furnish current for several hundred lights, five 110 volt lamps being used in series on either side. The dynamos run without sparks, there is no more evidence of high pressure visible at this plant, or in the Municipal 1,200 volt machines, than with 125 volt dynamos. There is probably no more perfect plan running than this, which has been in service since the middle of last year. Several imitators of the Municipal system were mentioned by the reader, one of whom was given credit for never having placed two plants on precisely the same principle.

The progress of the Edison Municipal system since the last meeting was considered, and entered into with much attention to details which pertain solely to the Edison people. Among those mentioned were Attica, Ind., Rochester, N. Y., Brockton, Mass., Vancouver, B. C., and others, each mentioned for some peculiar fact connected with that special plant.

A manager, he said, "quite likely had forgotten that when he was interested in that young telephone exchange, about 1880, he hung No. 16 iron wire on porcelain knobs, and used an old Western Union switchboard for the exchange, connected subscribers at $2.00 per month, and paid ten per cent. dividend to the stockholders without a thought that the life of the best overhead lines rarely exceeds ten years, and that the natural progress of events would oblige him to use a faster board in half that time." He compared that sort of business acumen with that of those who were competing for arc street lighting, and deprecated the foolish opposition which tends to destroy honest, healthy emulation. He thought this sort of thing would be short-lived, and would rapidly cure itself.

Some carefully-prepared statistics on lamp efficiency and life showed how little the average electric light man knows, and how much may be learned of the effect of a slight turn of the dynamo regulator, either for good or evil, from an economical standpoint.

The paper was listened to with profound interest, and won for the reader most vociferous applause.

Mr. Vail's paper was of great importance to the agents and owners of the various Edison Companies represented. It treated of the "Progress of our general business, and the various features of economy in station management."

Mr. Vail announced that since the summer meeting of the association, four of the local companies had been deprived of their leading men by death.

Mr. J. W. Phillips, late vice president of the Kansas City Company, who in a moment of temporary insanity committed suicide. Mr. Henry E. Lincoln, late manager of the Brockton Company, who was with the association at its last meeting. The circumstances of this demise are similar to those of the former. Mr. J. M. Marshall, late manager of the Grand Rapids, Mich., Company, died of heart disease. He also attended the August meeting. T. W. Embree, a victim of the boiler explosion at West Chester, Pa., who with seven others was buried in the ruins. He was well known as a regular attendant at the conventions, a faithful worker and a careful student.

By referring to our records for the month ending April 1, 1886, we find the total capitalization of all the Edison Illuminating Companies in the United States was $2,750,000. The data of December, 1887, show that a capitalization of $11,500,000 was employed at that date.

This certainly is a marked advance, and is the best evidence of acknowledged superiority of the Edison central station system as a business investment. The increased capitalization represents the growth of the system. Within the dates named there has been an increase of over three hundred per cent. in the number of Edison stations.

To the early or pioneer companies we must give much credit for the development of our system in its practical application. From their stations we have gained that valuable experience which enables us to install the more perfect station of the present.

The returns received showed an average increase of profits during the past, as compared with the previous year, of 28 per cent

He called attention to several load diagrams which showed peculiar characteristics. Exhibit number 1 shows two load lines from one of the New York stations. The load line for Nov. 28, 1887, shows a minimum of 500 amperes—a rapid rise of load from 8 to 10 A. M., when 6,000 amperes was reached; this load gradually increasing to 4.30 P. M., when it reached 7,350 amperes, and then rapidly diminishing after 5 P. M., the average for 24 hours being 3,050 amperes. Another date at same station made the following record:

Maximum load, 11.30 A. M., 9,000 amperes. Some variations occurred between that hour and 5 P. M., when the maximum was again reached. Average for 24 hours, 3,550 amperes.

Mr. V. claimed this as the champion record of the world. It is worthy of notice that these remarkable loads were carried at the original Edison central station, using the early type of steam dynamos, and the two-wire system.

Another diagram showed comparative records one year apart—an advance from an average of 1,030 amperes in 1886 to an average of 2,100 amperes in 1887.

A third diagram is also interesting. The lower line is the load on Jan. 26, 1887. Maximum, 1,500 amperes; average, 611 amperes; a plant on the three-wire system.

The larger load is that of December 3, 1887. Maximum, 3,975; average, 1,357 amperes on the three wire system. Reduced to a two-wire system the figures would read: maximum, 7,950 amperes; average, 2,714 amperes. The last two stations show a remarkable and very satisfactory increase in business for the year 1887.

Several tables (Exhibits 4 to 9) refer to monthly averages of expenses and profits, cost of oil, coal, dynamo repairs, wear of brushes, lamp renewals, etc., all which are of value only to the initiated.

Mr. V. congratulated the managers on the evident attention that had been paid to the teachings and information communicated through the conventions, as evidenced in the improved condition of affairs at the stations from whence reports had been received, and upon the general prosperity of the business. Under the head of improvements, the new Edison lamp was particularly noticed. In this new lamp we have secured an increased economy of 50 per cent.

In dynamos we can also congratulate ourselves that the Edison Machine Works have developed a new style of self-oiling and self-centering bearing which will largely reduce the amount of oil required for the operation of dynamos.

These bearings will be so constructed that they can be applied to any existing dynamo at reasonable cost.

A new dynamo, No. 28, has been produced, having a rated capacity of 70,000 volt amperes and an electrical efficiency of 96 per cent.

Various other improvements have been made in electrical apparatus for indication, regulation, and wiring. 1888 gives promise of marked advances.

The Parent Company has organized the Standardizing Bureau, with Mr. Jenks as director, and we feel assured that the best talent available in our business will be constantly consulted on the various details which need perfecting.

The growth of the municipal system, and the increasing interest in street lighting by incandescence, are subjects of congratulation, and local companies need not hesitate to apply it after the matter has been properly submitted and received judgment from our municipal department.

Evening Session.

Mr. R. M. Jones, or the Laramie Company, read a paper on "Automatic Balance Connection of Feeders, and Low Load Regulation."

Mr. Jones' paper does him credit, in as much as he has shown a desire to be something more than a mere man machine about the station. His idea consists mainly in making a balance wire compensate as a distributor, and thus regulate changes of load between districts, these balancing wires connecting all the positive feeder terminals as one, and the negative wires in the same manner. The neutral wire he does not consider in the arrangement, but leaves that as ordinarily placed.

A vein of quiet Western humor came to the surface now and again in Mr. Jones' paper, which was duly appreciated by the members.

At the close of the paper a spirited discussion occupied the convention's time until late in the evening, when an adjournment was had until ten o'clock Thursday morning.

Second Day.

The morning session was principally taken up by the reading and discussion of a paper by W. M. Mottram, superintendent of the New Orleans Edison plant, on the subject of alternate currents and their results, or words to that effect. Mr. Mottram brought out an array of figures and facts, most of which have been chronicled in the electrical papers in the past, and it is not necessary, therefore, to reproduce these here. The concluding idea of the paper is that if time is permitted, the race will not be a long one, between the direct and the alternate systems.

Mr. Bergmann was introduced to the convention and reported that his manufacturing company was making many improvements in apparatus, notably in switches and sockets.

Mr. Johnson, the president of Edison Electric Light Company, was then called for and requested to state to the association the present status of the patent litigation, and stated in substance that the suits were being pushed just as fast as the course of the law will permit—suits are pending on all the questions of infringement of the lamp system of distribution of current, etc., and are being pressed as rapidly as possible, all public statements of competitors to the contrary notwithstanding.

Mr. Johnson introduced Mr. Edison, who made a few remarks on the improvements he has in process, which will make the Edison system more perfect than ever.

Resolutions were then presented offering a vote of thanks to Mr. Johnson for his successful efforts in securing the presence of Mr. Edison at this convention. Passed by an unanimous rising vote.

Mr. Beggs then expressed thanks on behalf of the association, to Mr. Edison for his attendance on the convention, which was appreciated by every member.

The subject of the meter and contract systems was then taken up and discussed, and a motion was passed that, after a full discussion of the relative merits of the meter and contract systems in the numerous meetings of this association, that it is the sense of this association that the Edison meter is accurate, that the system is not too expensive for stations above 1,000 lights, and that the best financial results are secured in stations selling by meter.

A motion was passed for the appointment of a committee to draft suitable resolutions regarding the death of members since the last session Messrs. Jenks, Markle, Vail, Weeks and W. S. Howell were appointed.

The matter of use of motors and sale of current was presented by Mr. Harding, of the Sprague Electric Railway and Motor Company, and the sentiment seemed to be in favor of selling current on the meter system.

The convention adjourned *sine die* at 6.30 P. M.

Telephonic News

*** The "Brown" telephone is being presented to the people of Rochester, and the citizens are investigating the reliability of the claims of the new comer.

*** The Missouri & Kansas Telephone Company paid a six per cent. dividend out of earnings for the year 1887, added 923 subscribers, and built 162 miles of hard-drawn copper extra-territorial lines.

*** It is claimed to be impossible to put electric wires underground in New Orleans, because the water level is but three feet below the surface. Strong towers, 150 feet high, are erected, and on these telegraph and telephone wires are carried above the public streets. These towers are also used to sustain stand pipes, which have nozzles at different elevations where hose can be attached in case of fire.

*** An aged gentleman, member of a big Pittsburgh firm, hurried into the office the other day and asked for a $10,000 check, saying he could double it in a short time. It was refused by the wide-awake manager. The old gentleman was irate, and declared he would have the money, so to a bank around the corner he went. The manager telephoned the bank and payment of the check was refused. The old gentleman's anger knew no bounds, but he changed his temper when he learned that the parties he wanted to use the money on were bunco men, and that the manager had suspected as much. The telephone saved him.

*** At the meeting of the College of Physicians in Philadelphia, Dr. John Girdner, of New York, exhibited, by invitation of the college, for the first time, his telephonic probe, and explained its mode of application. The instrument is used to locate a bullet or other metal substance that has become lodged in the body. It is operated by the natural electricity in the patient. It consists of three parts: one, a sort of audiphone, which is placed over the physician's ears, a steel probe, and a steel bulb. The bulb is placed in the patient's mouth and the probe is inserted in the wound. If the probe strikes a piece of bone it makes no response, but if it strikes the metal which caused the wound it gives distinct clicking sounds.

*** The Nova Scotia Telephone Company has taken possession of the property and business of the Bell Telephone Company, and the connections with the trunk lines leading to different parts of the province was effected. The toll rates from Truro and places beyond will be 25 cents for a conversation of five minutes. A toll for the shorter circuits has not yet been fixed; it will probably be 15 cents. The central office system of the two companies is somewhat different. The Bell system will be continued for the present. Mr. A. A. Knudson, superintendent of the Nova Scotia Company, takes charges of the affairs, Mr. Edwards retaining his present position, and the staff of employes remaining the same.

*** A pamphlet containing the paper by Mr. William W. Jacques on "An Empirical Rule for Constructing Telephone Circuits," has been issued. It is taken from the "Proceedings of the American Academy of Arts and Sciences," and describes a number of valuable and interesting investigations made by Prof. Jacques as to the proper dimensions to be given to pole lines and cable conductors in order that they may be best fitted to transmit speech telephonically. He finds that the readiness with which telephone conversations may be carried over any circuit depends:

1. On the total electrical resistance of the circuit joining together the two stations.
2. On the total electrostatic capacity of this circuit.

The results are briefly formulated in the following rule:

"No matter what may be the distance between two points, good business conversation may be carried on between them, provided they be connected by a pole line or cable, or both, the product of whose total resistance by its total capacity is less than 2,000 if transmitters of the Blake type be used, and less than 4,500 if transmitters of the Hunnings type be used."

A number of valuable tables, showing resistance of wire per mile, etc., are given.

The Telephone Still a Very Live Question.

HOW A CHICAGO NEWSPAPER TOOK IT ALL BACK—ST. LOUIS IN HOT WATER.

To the Editor of Electrical Review:

I want to give you a few of the incidents connected with telephone life and work in the West. Your readers will, possibly, find not only something to interest them in what I write, but those of telephonic experience will recognize what follows as having a familiar sound, suggestive of former encounters with the press, the public and the patron.

There was a time when a daily newspaper had a dignified and honored position, and was a real power in the land, for good or for evil; when it spoke the people listened. That day has passed, the power seems to have vanished; and now, when the daily journal speaks, it strives to excite a laugh. It is illustrated, and owns a funny man, whose duty it is to make the people laugh at the comic almanac jokes he perpetrates, or the wonderful sarcasm or irony which gives science and progress the laugh. Only a short time since one of these phunny phellows wrote up Dr. DeBausset's system of air navigation—the only sensible road to the solution of the problem—and was very facetious both as to matter and illustrations.

The phunny phellow is a wholesale liar as well as traducer, and when he is given a loose rein sometimes fetches up where it used to be said a beggar would go on horseback.

Here is a case in point, from the Sunday issue of one of Chicago's leading papers:

The Chicago Telephone Company's bill collector called at the office of "John H. Hamline, Room 60, No. 107 Dearborn street," the other day to collect $125 for the use of one telephone for one year. Mr. Hamline is one of the aldermen for the third ward, but the bill collector didn't know that.

"I won't pay it," said Mr. Hamline. "I notified you long ago to take your instrument away from here. I haven't used it, and I couldn't use it if I would, and I wouldn't if I could. Get out."

The collector was calm. He is accustomed to this sort of reception.

"If you don't pay we'll have to sue you," he said.

"Sue away," said Mr. Hamline. "I'm willing to pay for the time I used it—or tried to use it—prior to notifying you to take the thing away, but not a cent more."

"Read your contract," said the collector. "You hired the instrument for a year, and you have got to pay for a year, whether you used it or not."

"Contract be blowed!" said Mr. Hamline. "Your service is abominable, your instrument a nuisance, your employers a pack of—of—of——"

"Take care," said the collector. "Libel suit for——"

"Of soulless knaves," concluded Mr. Hamline. "And now you get out of here. And if you don't take your instrument away I'll chuck it in the street."

The collector got back to the office and reported to the chief bookkeeper that "that lawyer fellow Hamline" wouldn't pay.

"What's that?" inquired Mr. Phillips, sharply, Mr. Phillips having overheard the conversation. Mr. Phillips is president and general manager of the Chicago Telephone Company. He is Mr. Fay's successor, and a worthy one In fact, he could give Mr. Fay points in some things. In the handling of aldermen, for instance. "What's that?" inquired Mr. Phillips, sharply.

"Hamline won't pay," said the chief bookkeeper.

"Great Scott!" said Mr. Phillips, jumping up and glaring at his chief bookkeeper. "You don't mean to say you sent a bill collector to Ald. Hamline, do you?"

"Yes, sir; the bill collector went to him, but he won't pay."

"Why, you dunder-headed fool! You monumental donkey! You champion prize-winner blue-ribboned idiot! You—you—you—you don't mean to say—you—you—you—sent—a—bill—collector—to—Ald.—Hamline?"

Mr. Phillips gasped out the words. His wrath was choking him. The chief bookkeeper kept silent.

"Didn't you know that all aldermen are deadheads?" continued Mr. Phillips, when he recovered his breath.

"No, sir," said the chief bookkeeper. "They always had to pay before—there was no difference made that I know of."

"Then mark 'em all deadheads," commanded Mr. Phillips. And it was so.

Ald. Whelan, Mueller, Appleton, McCormick, and the other city council saloon keepers will probably have telephones put behind their bars immediately. Other aldermen who have telephones needn't pay, and those who have none may get some in immediately.

The bill-collector hasn't been to see Ald. Hamline since, and the telephone is still there, awaiting removal.

Mr. Phillips was president of the Central Union—another branch of the Bell Telephone monopoly—up to Jan. 1, when he came to Chicago to take Mr. Fay's place as president of the Chicago company.

The laugh lasted in the street until Monday's issue of the same paper, when it came to light that somebody had suggested a supplement, which reads as follows:

In the *Tribune* yesterday appeared a statement to the effect that Ald. Hamline had refused to pay a bill of $125 presented by the telephone company, and that Mr. Phillips, President and General Manager of the Chicago Telephone Company, upon the matter being called to his attention, roundly denounced his employes for presuming to present such a bill, and informed them that all aldermen are deadheads. It appears that injustice has been done the parties interested, and that the facts are that Ald. Hamline has not had a telephone in his office for two years, has no contract with the telephone company, and therefore, being under no obligations to it, could not have refused to pay one of its bills, for the good and sufficient reason that none had been presented. The following letter from Mr. Phillips also shows that the story was without foundation:

Mr. John H. Hamline:—DEAR SIR: With regard to the article in to-day's *Tribune* under the caption of "The Aldermen are Deadheads," I desire to say that I have never had a conversation with any officer or employe of the Chicago Telephone Company (or anyone else) with regard to your telephone bill, or your telephone service, or, in fact, anything else relating to the subject. I did not know that you ever had a telephone. So far as I am concerned the interview is untrue.

Yours truly,
GEORGE L. PHILLIPS, President.

Finally, on Tuesday, the phunny phellow had to be appeased, and this little whimper, like the threat and sullen shake of the boy's head after his successful opponent has punished him and got out of hearing, was tucked away in one corner of the sheet, where probably not one of a dozen readers would see it.

"The article about Ald. Hamline's telephone seems likely to rise in importance to the dignity of a newspaper Schleswig-Holstein question. The *Tribune* will only say that the reporter who wrote the original account for this paper, though probably misinformed, acted in good faith, and was justified abundantly in sending in the article on the information he had."

As the office boy says:

"Of all game dinners here below
Save me from crow.
And such desserts offend my eye
As humble pie."

This war on the telephone companies has induced another of the outside companies to ask for a franchise in Chicago. The Interstate Telephone Company, Chas. W. Partridge, president, claiming to have "a telephone patent that infringes on no others, and is superior to the Bell," presented a petition at the last meeting of the council, asking the privilege of erecting lines and placing instruments, and offering to give good telephone service to the citizens at $60 per annum. The matter was referred to the Committee on Fire and Water.

The Cincinnati *Times-Star* of the 26th instant, referring to the telephone question in Ohio, says:

"The same old telephone chestnut has again been brought before the law givers at Columbus. It is a bill fashioned much after the Indiana *faux pas*. It is the same musty reiteration which has been made to 'do service' in nearly every State in the Union, and which has done more to hedge in and embarrass the business men of the Hoosier State than any other legislative enactment ever adopted. Business men of this city [Cincinnati] are not complaining about the telephone service, nor of the price.

"The only possible complaints are from those who would growl if their telephones were furnished them gratuitously and the entire service of the exchange were devoted to watching their exclusive interests. Ohio does not want the experience Indiana has had for the last two years. A pay-station in every house where a telephone is set up means an expense of several hundred dollars a year to an extensive business house. It means five or ten cents every time the exchange is called. The average cost to subscribers in Cincinnati last year for every message sent was one cent and a-half, and the average number of messages sent daily by each subscriber was fifteen. Is any thrifty business man going to object to such a bagatelle of cost for so important a necessity?"

St. Louis, too, is in hot water on the telephone question. A "crusade," whatever that may be, has been organized. Now, while the unhappy twin Minnesota towns are having their ice palace shows, and the citrus exhibit is dodging its way between blizzards, and New Orleans and Memphis are preparing for the Grease Tuesday carnival, it is highly proper that St. Louis should wake up and have an original show. The Sancho Panzas and Don Quixotes might lead the other discontented knights in a charge against Manager Durant's Windmill, and break lances in the good cause as an ante-lent festivity. They might have lots of fun before the egg and fish season sets in, and put themselves in capital physical condition to withstand the forty days' abstinence now so close at hand. One of the strategical movements of the crusade is to get the municipal assembly to fix the rates at $50 per year. Mr. Fielding Mansfield, who is in charge of the petition, says:

"In the smaller towns throughout the West the yearly charge for the use of a telephone is much cheaper than it is in this big city. You can get a telephone in almost any Western city for much less than you are required to pay in St. Louis, and you are served with just as good a telephone and get just as good service. The Bell company charges $100 a year for each instrument, and it has on its list about 2,000 subscribers. This will show that the company's yearly income from its subscribers is about $200,000. The Pan Telephone Company wanted to come in here and do business at $50 a year, and the Bell people crowded it out."

In other words, a telephone exchange with a couple of hundred subscribers costs as much to run, and is worth as much, absolutely—not *pro rata*—as one of 2,000 subscribers, to any one of the consumers.

The Chicago West Division Horse Railway people have been thinking over the matter of an electrical railway. Something has to be done soon, or we will have trouble with the people who earn their bread on the south and live on the west side. Both the north and south divisions have cable cars—the north division lines will be running in a few days—but the west, which covers half or more of the city directory pages, is still bumping along at the same old gait, the driver standing like a hen in the rain, first on one foot and then on the other, and beating the sheet iron dash board with the reins to keep the animals from stopping to scratch.

Chicago, Feb. 8.

Roosters Heard to Crow Miles Away by Telephone.

At the winter quarters of Barnum's show in Bridgeport is a long distance telephone wire connecting directly with Mr. Barnum's office at the Madison Square Garden in New York. While the recent poultry show was in progress in the gardens, the roosters raised such a racket by crowing, that it was almost impossible for the New York clerks to hear at their end of the line, especially in the morning. The crowing could be distinctly heard in Bridgeport, and the Shanghai's piping screech was fully as distinguishable as the crow of the biggest rooster in the show.

*** At San Francisco, Fire Commissioner Edwards appeared before the fire department committee in support of a communication from his board, asking that telephones be placed in all the engine and hose houses. He stated that the object was to enable firemen to communicate with the district engineers and fire alarm office, so that the department need not be called out for burning chimneys and trivial fires. Many alarms were what the firemen called "stills," where a single engine went out to fight the fire. If there was telephonic connection with all the houses the men could send in and have an engineer go out to command them. In this way much property could be saved and the apparatus preserved. Nearly every alarm resulted in some accident, and every one cost the department between $200 and $300 in wear and tear. The rent of the telephones, he thought, could be more than saved every month. After some discussion the committee agreedto have the telephones put in as requested Mr. Edwards.

Fables About the Wires.

TELEGRAPH DEADHEADS—A PLAY FOUNDED UPON SOMETHING THAT MRS. MACKAY DOES NOT DO.

In the charming play of "L'Abbe Constantin," now current at Wallack's Theater, the character of Mrs. Scott, which was originally allotted to Miss Coghlan, but is now done by Minnie Conway Tearle, is understood, says the *Mail and Express*, to have been modeled on Mrs. Mackay, who has for several years past resided for a goodly portion of her time in Paris. The idea of the wife of an American millionaire living in a palace in Paris, and spending more money in one month than many of their princes and dukes are able to spend in the whole course of a year, seems to have taken possession of the Parisian imagination, and Halevy's dramatic reproduction of Mrs. Mackay has, together with the play which he has built around it, met with very cordial favor in the French capital. Mrs. Mackay is represented in the course of the story as going down into the rural districts of France and taking possession of a French chateau and estate there, which had been previously purchased by Mr. Mackay, and the negotiations for which purchase had been carried on and consummated through the medium of Mr. Mackay's cable. Mrs. Mackay meets the Abbe Constantin, a simple and charming old pastor, and astonishes him, together with her sister, by giving some 2,000 francs to him out of hand, wherewith to carry on his charitable work, promising him in addition 500 francs as a monthly allowance. During the course of the conversation with the rural prelate, Mrs. Mackay discourses about her husband's cable, and the numerous advantages attending upon having a cable which belongs entirely to the family, and which can be used at short notice and to any extent that may be desired. She describes how her husband is really between 3,000 and 6,000 miles away; that they are enabled, without cost to themselves, to exchange daily communications which reach their destination within an hour or so—much more speedily, in fact, than could be accomplished by means of the ordinary letter—so that, notwithstanding that an ocean divides them, neither the husband nor the wife feels that fact at all.

A *Mail and Express* reporter was relating this interesting dramatic incident to Dr. Green, the president of the Western Union Telegraph Company, the other day. He said that while he was still in Tennessee he received an application from a young man of Clarksville, who was a telegraph operator there, asking for a similar position at a station some thirty miles down the road. Dr. Green asked him why in the world he wanted to make the change, as there was no additional salary involved, and he seemed to be very comfortable where he was. He said he didn't want to go down there; he simply wanted the place for his wife. Subsequently Dr. Green had business at the station, where meanwhile the wife had been employed, and he began commiserating with her on her very lonely condition. The husband and wife, by reason of the circumstances in the case, had no opportunity of seeing each other. She was employed during the day, as also the husband, and at night there was no train, or none running at such times as would enable them to make a trip without interfering with their work. She replied, however, that they got on very well, that she greeted him every morning with a morning kiss, and saluted him at evening when she finished work for the day. The kiss was, of course, by telegraph, and was rather unsubstantial, but as long as they were poor, as they were at that time it would have to serve.

About the telegraph deadheading which Mr. and Mrs. Mackay do every day, according to the dramatic and picturesque imagination of M. Halevy, General Manager Ward, of the Commercial Cable Company, said that it had no existence in fact at all. Mr. and Mrs. Mackay used the cable to a certain limited extent, but they pay for every message sent. They do not use it for the sake of using it, and do not send messages except when necessary. Mr. Mackay, he said, made a particular point that no personal business of his, nor of his wife, nor of his friends, should go over the lines without paying toll. As a matter of fact, although Mr. Mackay is practically owner of the cable, Mr. Bennett paid for and still possesses a share of it, and although probably no objection would be made to his using the lines for social messages, still, in consideration of the fact that Mr. Bennett uses it for newspaper purposes, and always pays for it, Mr. Mackay does not think that he should figure as a deadhead. Frequently personal friends of Mr. Mackay's, not understanding the situation of affairs, ask him if they can use his cable free, and when he grants permission to do so, instructions of a very explicit kind are left at the office that all such messages shall be charged up to his account. Mr. Mackay is now out West, dividing his time between San Francisco and Virginia City, and Mrs. Mackay is in London. As a matter of fact, the husband and wife, although some 6,000 miles apart, are at the two ends of Mr. Mackay's system of cables and telegraph lines. From New York the Postal lines, which Mr. Mackay controls and of which he is the owner, in connection with the lines along the Canadian Pacific road, reach him at San Francisco. Notwithstanding all this, however, and the cable and telegraph facilities which this married couple enjoy, the probability is that they use the old device of writing letters to each other just as much as though telegraphy had never been invented.

Jay Gould, who is now on board his yacht in the far East, and when he was last heard of had just left Alexandria, sends a daily dispatch to his son, George Gould, in the Western Union building, and keeps him well posted as to all his movements. For every one of these dispatches Mr. Gould pays cold cash. The probability is he does not care to bother about the deadheading. If he were in London any cablegrams that he had to send could go over any of the lines belonging to the pool simply designated service dispatches. The cables which reach out to where he is now are controlled altogether in England, and possibly he does not care to ask any favors. Most of the cables extending from England through the Mediterranean out to India, and from Lisbon to the Brazils, are controlled by a corporation known in England as the Globe Trust, whereof John Pender is the leading spirit.

There is not nearly so much deadheading on the telegraph lines as there used to be. A determined effort has been made of late to cut down the amount of it. There never has been issued anything in the way of a pass analogous to the passes issued by railroad companies in the beautiful and much-regretted long ago before the Interstate Commerce law came into effect. What the telegraph companies did sometimes issue were little books gotten up on the principle of the railroad mileage books, entitling the holder thereof to send so many thousand words free of expense to himself, but even these have now been withdrawn wherever it has been possible to do so. The railroads get a great deal of free telegraphing, but in consideration of the fact that they do a great deal for the telegraph companies, and that without them the telegraph companies would find a great deal of trouble in existing at all, this can scarcely be called deadheading in any true sense of the word. Mr. Gould once said to the writer that out of some 25,000 employes the railroads furnished and paid for eighteen or nineteen thousand of them, and that through the country nearly all the offices were supplied by the railroads. The fact that the government could never enter into any such partnership as this with the railroads, which makes profitable telegraphing possible, is one of the strongest arguments advanced against the proposition of government control of the wires.

* * Electricity is being used to purify sewage. It produces a chemical change by which the solid matter comes to the surface and pure water flows off.

Interstate Telegraphy.

A bill introduced in the Senate on January 26, by Senator Spooner, to regulate commerce carried on by telegraph, defines in its first section the term "telegraph company," as used in the bill, to mean persons or corporations engaged in interstate telegraphy for hire or in telegraphy between a foreign country and the United States.

Sections 2 and 3 declare that all charges for telegraph service shall be reasonable and just, and that it shall be unlawful for any telegraph company to give any unreasonable preference or advantage to any any person, company, corporation locality or class of business, or to subject any persons, places or businesses to any unreasonable discrimination. Every telegraphic company shall afford reasonably equal facilities to connecting lines, and shall not discriminate in the rates and charges between connecting lines.

Section 4 makes it unlawful for any telegraph company to enter into any contract, agreement or combination with any other telegraph company to divide between them the aggregate or net proceeds of the earnings of such companies.

Section 5 makes it unlawful for any telegraph company directly or indirectly, by any special rate, rebate, drawback or device, to charge or receive from any persons or corporations any greater or less compensation for any service than it charges or receives from any other persons or corporations for doing a like and contemporaneous service.

Section 6 requires telegraph companies to publish their rates and to file with the Interstate Commerce Commission a schedule thereof, and to notify the commission ten days beforehand of any proposed changes, subject to penalties for disobedience. The companies may be compelled by mandamus to comply with these requirements.

Sections 7 and 8 provide that telegraph companies violating the provisions of the bill shall be liable to the persons injured thereby for damages, which may be recovered either by suit before the commission or the courts. In suits for damages the telegraph company is required to produce its books, and its officers are required to answer any questions proponded to them, no matter whether of a criminating nature or not, but their testimony shall not be used against them in any criminal case.

The remaining sections of the bill give the Interstate Commerce Commission jurisdiction over interstate telegraph business, fix penalties for violation of the act, authorize the commission to inquire into the business of telegraph companies and to investigate complaints under substanttally the same provisions that complaints alleging infractions of the interstate commerce law are now examined into by the commission.

.... "One night," said Jim Doyle, Baltimore agent of the United Press Association, "when I was the operator at Lock Haven, Pennsylvania, I had a queer experience. A man had come down the road with a corpse in a coffin, and it had to stay there all night. He was all tired out, and after he had gotten the corpse out on the platform, as I was the only man around there, he asked me to keep an eye on it. I told him if he wanted me to watch it he had better bring it into the office. So we carried it in, and as the office was not a large one, it was pretty close quarters. The man went to bed. I had a friend in charge of the night office at Montandon, and used to amuse myself when it was dull telling him over the wires what was going on. He kept a dog and I kept a cat, and accounts of their antics formed most of the business at night between the two offices. This night I told him about the pleasant companion I had, and he began to suggest all sorts of weird and unholy things about the corpse. Finally, over the wires came the pleasant warning 'Look out, Jim! the corpse is sitting up in his coffin!' Just as he sent this my cat, who had climbed up on the coffin, began to scratch away on the wood in a horrible manner. The blood froze in my veins. I believed that the Montandon man was right. My hair stood straight on end, and it was some seconds before I could summon sufficient courage to look around and discover it was the cat. I got a $5 note for watching that corpse, but it was well worth it."

TELEGRAPHIC

.... The millennium is coming, but it's in no great rush. Perhaps a messenger boy is bringing it.—*Nebraska State Journal.*

.... An Australian lieutenant wants an electrical pilot engine, connected by wires, to precede every train and prevent accidents by warning.

.... A San Francisco doctor has a scheme to make it rain by electricity. He will use a gigantic electric balloon and make it rain wherever he wants to, by running a cable thither from the balloon.

.... An Eastern Ohio telegraph company has placed a contract for the construction of a line from Cleveland to Erie. The Eastern Ohio Company is working with the Postal Telegraph Company, and the intention is to connect Erie in sixty days. The Western Union absorbed the Baltimore and Ohio opposition there two months ago.

.... The last year has seen a wonderful growth in electric railways. There are now in the United States over 80 miles of road on which the motive power is electricity. Eighteen towns have plants in operation, in lengths varying from one to eleven miles. Contracts have been made for roads, and they are now being constructed in seventeen other towns, and there are fifty-nine projected roads.

.... The Southern Massachusetts Fire Alarm Company has been organized at Portland, with a capital stock of $50,000; par value of shares, $100. The stockholders are Albert P. Sawyer, Newburyport, Mass.; Nathan D. Chase and Hale Remington, Fall River, Mass. Albert P. Sawyer is president; Hale Remington, treasurer, and the above-named stockholders are directors. The purposes of the corporation are, to carry on the business of applying fire or other alarms, original, general and auxiliary; to license the use of such alarms; to license others to carry on the whole or any part of such business; and to carry on any other business properly connected with the foregoing.

.... "I remember some years ago," said Manager Bloxham of the Western Union, Baltimore, "when I was an operator on the Western Union, and when General Eckert, the general manager, came into the office and said to one of the clerks, 'Blow up stairs and ask if they can get Harrisburg.' The man in charge, without trying, whistled down, 'Tell the gentleman I can't get it.' The visitor replied, 'Tell that man who says he can't get it to come down stairs a minute; General Eckert wants to see him.' The man came down stairs, and General Eckert in a few words told him that they wanted no man in their employ who used the word 'can't.' It was a word, he said, that was not in the vocabulary of the Western Union. After a few more plain words on the subject, General Eckert sent the man back to his work, sadder but wiser."

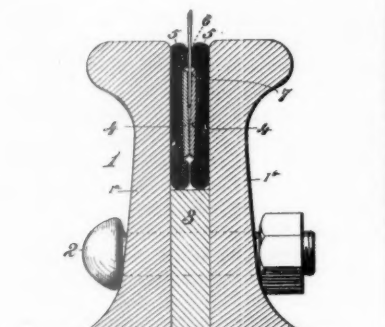
.... At the recent fire in Pittsburgh, the Western Union Telegraph Company had a total of 115 wires either running over or in front of the buildings, and of these eighty were cut, burned or broken. The accident, however, occurring as it did early Sunday morning, when but few messages are transmitted, caused but little inconvenience. The firemen had no sooner left the coast clear, at about 1.30, than fifteen linemen, under charge of an experienced foreman, started to repair the damage. They found all the lines that had not been separated so badly injured that it was decided to replace them with new ones. This made four sections of new wires, or 115 in all, that had to be strung immediately. These four sections reached from Wood to Market street, and were strung so quickly that by five o'clock messages were being received over them. Telegraph men regard the feat as almost phenomenal, as it usually takes the greater part of a day to accomplish a similar task.

ELECTRICAL AND SCIENTIFIC

We illustrate herewith a few of the important electrical patents for the week ending February 7, 1888:

Patent No. 377,397, W. I. Ludlow, Electric railway. February 7, 1888:

1 designates one of the rails of the road, which is composed of steel, and constructed in two separate sections, 1^a 1^b, of substantially equal dimensions, united by tie bolts 2, which pass through the rail sections, and also through interposed washers 3, which serve to separate the rail sections. These washers extend a little above the line of bolts, leaving a space above. Within the space thus formed I place the electrical conductors 4, two continuous copper plates or strips laid face to

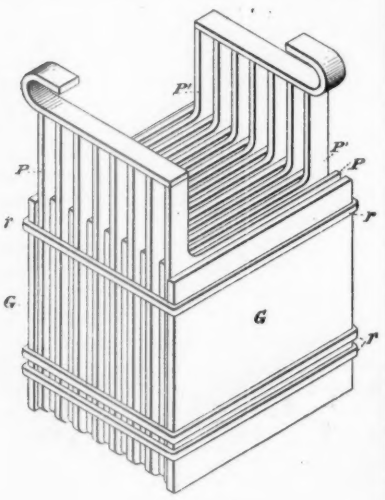


No. 377,397.

face, insulated by rubber strips 5, which fill the space between the rail sections above the washers 3. Each insulating strip is provided with a cavity capable of accommodating one of the conductors, and the edge is rounded, as shown in Fig. 1, a shallow trough 6, being formed by the meeting of the two rounded edges. The edges of the copper conductors 4 are beveled off inwardly, as shown. The current is conveyed to the car motor by means of a thin metallic plate 8, Fig. 2, which is carried by the motor and slides between the copper strips 4, the circuit being interrupted in any suitable manner.

Patent No. 377,642, J. S. Sellon, assignor to the Electrical Accumulator Co., of New York, Secondary battery. February 7, 1888:

The plate P is preferably of lead, having a series of perforations filled with a paste of lead oxide, and after the paste is in position I clear a series of the holes and drive in a series of india-rubber or other suitable plugs.



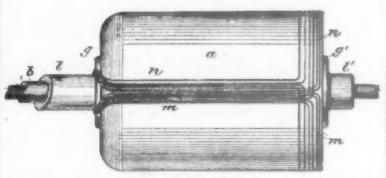
No. 377,642.

It is desirable to have the paste in position when the plugs are driven in, as it strengthens the divisions and avoids breaking or bending the plate or support. The plugs must project a short distance from the opposite surfaces of the plates. I prefer to plug only the positives. In this way there is a plugged positive on both sides of every negative. P is the plugged positive plate, and P' the unplugged negatives. Before placing in the inclosing cell the plates are arranged in alternate order, and the two side plates of insulating material, preferably of glass, G, are placed upon opposite sides of the assembled plates, the whole united by bands r of insulating material.

Patent No. 377,683. R. H. Mather, Armature. February 7, 1888:

Makes use of a stationary armature shaft and a stationary armature-core mounted thereon, in combination with a revolving cylinder or drum, which is formed of non-magnetic and non-conducting material, is wound with the armature coils in a peculiar manner, is mounted upon said shaft, and contains said armature core.

The armature coils, instead of being wound directly upon the armature core, are wound upon a drum, a, which is a cylindrical shell of non-magnetic and insulating ma-



No. 377,683.

terial, and preferably of paper-pulp, made and pressed in a mould by a process similar to that employed in making paper barrels. At one end this drum is nearly closed, like a thimble, but has there a central opening, where the shaft s passes through. At the other end this drum has an end piece or cover. The disk D, which is formed of like material with the drum a, is secured to the cylindrical part of the same by suitable screws, e e, and has also a central opening where said shaft passes through. The winding is clearly illustrated in the cut, and is adapted to render it possible to readily remove and replace the rotating drum.

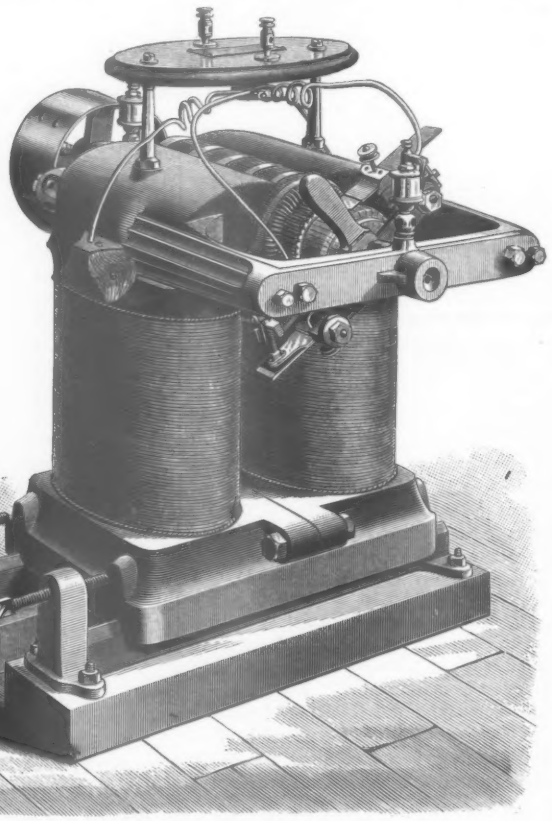


FIG. 2.—EXCITER.—SLATTERY SYSTEM.

"Good-By, Graphophone."

Under the above heading the Washington *Capital* has the following:

What is the matter with graphophone stock?

Last summer it sold at 35—par 10. Now it is selling for 5, and people seem to be glad to get rid of it at any price. There are 60,000 shares in the American Company, and most of them are held in Washington. * * * * There is no doubt that the graphophone business has been very badly managed. It was all wrong to begin to sell stock before the machines were ready for sale and use. It was all wrong to sell stock in the enterprise until some arrangement was made with Mr. Edison, who owned the phonograph patents.

"The new Edison phonograph," said a gentleman connected with the company, "is now completed, and we are about ready for business. I have found several holders of graphophone stock claiming that negotiations were pending with Edison, and the stock has been kept up on this statement. Now let me say, once for all, there will be no consolidation of its interests, and just as soon as the graphophone comes upon the market, if it ever does, Edison will enter suit immediately."

The Slattery Electrical Distribution System.

We illustrate this week the principal features of the Slattery apparatus for distribution by induction. This apparatus is now manufactured by the Fort Wayne-Jenney Electric Light Company, of Fort Wayne, Ind.

In working out this system Mr. Slattery has been ably assisted by Robb MacKie, who is assistant electrician of the Fort Wayne-Jenney Electric Light Company. The various factors comprising the system are shown in the accompanying figures.

In deciding upon the particular type of dynamos most suitable for the work to be done, two were chosen, built, and put into practical operation. These types were the Siemens' disk armature and the Loutin, and after careful and exhaustive test, the Loutin

FIG. 3.—RESISTANCE BOX FOR EXCITER.

type was selected, and with many improvements, electrical and mechanical.

It will be seen from the engraving (Fig. 1), that so far as symmetrical and mechanical construction is concerned, in which is combined rigidity and simplicity throughout, the builders are warranted in the confidence they justly feel in the successful performance of the work that has to be accomplished by it.

When it is said that upon the armature of the machine capable of supplying 1,800 16 candle power 50 volt lamps there are but 35 pounds of copper wire, it will be understood by those familiar with the business that the ideal construction is closely approached, and that the greatest care has been exercised in electrically disposing of every part of the dynamo, with a view of obtaining maximum efficiency from the minimum of mass.

Fig. 2 illustrates the type of exciter employed with this system.

An exterior view of the converter is shown in Fig. 8. The interior construction is briefly described: The copper wire is wound upon a core, consisting of insulated iron plates, rectangular in form, divided centrally, and placed back to back, previously having had a sufficient portion of the center cut out, in which space the coil referred to is wound. The magnetic circuit is then closed around the sides of this coil by the other half of the rectangular plate referred to. The coefficient of induction in this converter is equal to a volt per five inches of wire, the ratio of conversion twenty to one, and there are nearly two pounds of iron per secondary ampere capacity. The working pressure of the system is 1,000 volts at the poles of the primary coil and 50 volts at the poles of the secondary coil.

A special insulating compound is used in these converters, and this is of such a character that the chances of cross circuiting of the convolutions of the primary coils are very remote indeed. In each converter, conveniently placed, are primary and secondary fuses, which are easy of access.

The central station instruments, viz, pressure indicator and ammeter, are especially constructed for measurements of alternating currents and potentials, and are both simple

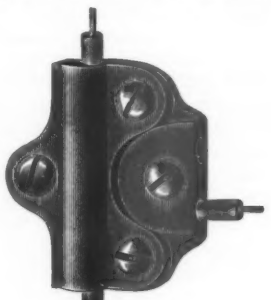


FIG. 4.—PRIMARY CIRCUIT BRANCH CLAMP.

in construction and extremely delicate in operation. A description of one instrument will answer for both. Two flat metallic spools, divided at one side, have wound thereon the requisite number of convolutions of wire. These spools are mounted upon a rectangular frame common to both, one being placed in eccentric relation to the other, in order to modify the parallel plane of the convolutions of the respective coils, for the purpose of reducing self-induction. In order to obtain a due and proportional measurement of current or potential in relation to the spools, a circumferentially disposed inverted horseshoe-shaped piece of iron is attached to a central shaft, which is mounted upon jeweled centers, and carries a pointer, which is deflected according to the varying potentials and strength of current.

Not the least of the important factors in this system is a meter for measuring the energy supplied to each customer.

A very simple central station device is used for safely and easily coupling alternating current dynamos in multiple arc.

A recording device is placed by the superintendent in proper relation in the circuit for the work it has to do—at night, for instance, as he leaves the station. In the morning when he returns he consults the apparatus, and sees exactly the extent of the irregularity due to the carelessness of the attendant, and the electrical disturbance which may have taken place during his absence. This will, no doubt, commend itself to central station superintendents as a means of compelling, if possible, more careful performance of duty, a laxity of which has frequently resulted in many irregularities unpleasant to relate.

Fig. 4 is adjustable clamp branch connector, used to connect branches with the main line, and enables the lineman to dispense with the use of solder, rendering the work more expeditious, and making a far more effectual joint. In conjunction with this branch connector, is used a branch switch safety fuse, Fig. 5, which is placed at the junction of a primary branch and the main line. Here again the safety of those whose duty it is to replace burnt-out fuses is considered, as they can by means of the switch, shown in the interior of the fuse box, disconnect the fuse terminal from the line and then safely adjust the fuse. One of

these boxes is placed on each side of a parallel circuit. Figs. 6 and 7 are smaller sizes of Figs. 4 and 5, and are employed to connect the primary coil of converter with the external primary circuit.

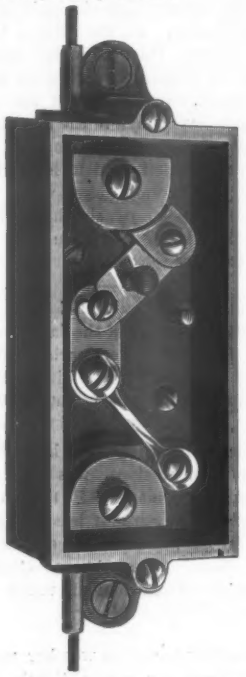


FIG. 5.—PRIMARY CIRCUIT—BRANCH FUSE BOX—(COVER REMOVED.)

Figs. 9 to 15 represent the fusible wiring details, the special object in the construction of which has been greater facility in wiring and safety when wired, and evidences thorough familiarity with both plain cleat and molding wiring, and every requirement which may arise in this branch of work.

Fig. 15 represents the lamp, shade-holder and key-socket.

—— The local gas and electric light companies at Lynn, Mass., have consolidated.

—— The report of the commissioners relative to the insulated electric wires on the United States steamship Atlanta, was extremely favorable to the Okonite Company, the well-known manufacturers of telegraph and telephone wires of New York.

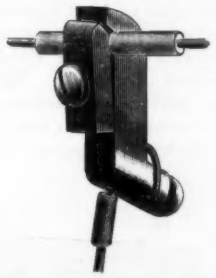


FIG. 6.—PRIMARY CIRCUIT—CLAMP FOR BRANCH TO CONVERTER.

—— The Electrical Accumulator and Lighting Company, of Bridgeport, Conn., has been organized. Sherman H. Hubbard, R. Hubbard, and Col. Fred. A. Mason, of Bridgeport, are among the list of shareholders.

—— A telephone wire crossed with an electric light wire caused the death of a horse and a colored man in Buffalo last week. The underground question in Buffalo, as a natural consequence, is being agitated with renewed zeal.

—— The new electric railway in Richmond, Va., which was equipped by the Sprague Electric Railway and Motor Company, of New York, is working successfully under very trying conditions, and is attracting considerable notice.

—— The officers of the Edison Illuminating Company at Baltimore are Thomas J. Shryock, president; William A. Dunn, vice-president and general manager; Morris P. Stevens, secretary, and John H. Fowler, treasurer. Office, 21 Chamber of Commerce.

—— Allen D. Chandler, John A. Smith, James W. Bailey, C. C. Sanders, and others have chartered the Gainesville (Ga.) Light Company, to build gas works, erect electric light plant, etc. The capital stock is $20,000.

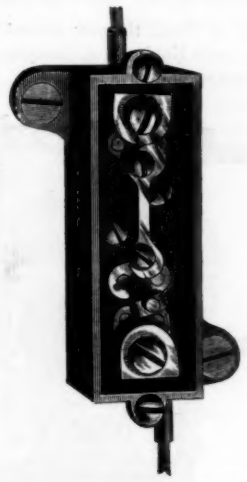


FIG 7.—PRIMARY CIRCUIT—FUSE BOX FOR BRANCHES TO CONVERTER (COVER REMOVED.)

—— Philadelphia is talking of an electrical subway big enough for all the wires and for street cars as well.

FIG. 1.—ALTERNATING CURRENT DYNAMO.—SLATTERY SYSTEM

—— Ten new electric cars are being built for the Fourth avenue street car company, New York. The contract provides for the delivery of so much power per car at a certain price, and this price is about 40 per cent. below what the same power would cost, furnished by horses. Julien storage batteries will be used, and it is expected that the ten cars will all be ready for use this spring.

—— From recent advices received, we observe that the Lord Commissioner of the Admiralty of England, after a trial at Portsmouth, reports that the okonite wires in use by them have proven eminently satisfactory. The acknowledgment is signed by Hon. Evan Macgregor.

ELECTRIC LIGHT NEWS

—— The officials of Riverhead, L. I., are considering the electric light question.

—— Martin P. Congdon is interested in an electric plant to be established at Knoxville, Tenn.

—— "S. L." and "F. A.," from Iowa, should let us know who they are if they want their queries answered.

—— The Ada Electric Light Company, Ada, Ohio, has been incorporated. Capital stock, $10,000. F. L. Bauman and others incorporators.

—— The Fayettville (Ark.) Electric Light and Power Company has been formed with a capital stock of $30,000. E. B. Harrison is at its head.

—— The Paris Edison Electric Light Company, Paris, Me., has been incorporated. Capital stock, $10,000. Joseph C. Finckiin and others, incorporators.

—— The Anna Electric Light Company, Anna, Ill., has been incorporated. Capital stock, $25,000. Charles V. Nordling and Christian Nordling incorporators.

—— The Citizens' Electric Light and Steam Heating Company, Peoria, Ill., has been incorporated. Capital stock, $25,000. Edward M. Ames and others incorporators.

—— At Northport, L. I., the question of organizing an electric light company for the purpose of lighting the streets and stores by electricity is being discussed, and the prospects are that the movement will be successful.

—— The Oswego (Kan.) Electric Light Company has been organized, with a capital stock of $60,000. Incorporators: F. L. Greene, C. D. Woodford, C. W. White, Hugh McNellis, C. B. Woodford, all of Oswego.

—— It is proposed to place an electric light plant at a point between the village of Islip, L. I., and Bay Shore, powerful enough to supply both places with arc and incandescent lights. Nothing definite has as yet been done.

—— At Bridgeport, Conn., the electric light company will soon run a mercantile wire into East Bridgeport for the purpose of supplying merchants and others with incandescent lights. This is a well-arranged and enterprising electric light company.

—— There has been a great deal of comment on the part of officials of the smaller cities of the Union over the statement that all the electric wires in New York city are underground, and working well. Citizens of New York, of course, know the statement to be far from true. A recent statement by Chief Clary, of Memphis to this effect was quickly controverted by the following telegram received from New York by Mr. Ralph Semmes, of the Brush Company: "No arc light wires, very little telegraph and telephone wires underground."

—— The county jail at Milwaukee, so the supervisors claim, is supplied with a gas meter of a particularly vicious and refractory sort. The bill for lighting the bastile during the month of December was $111. Moreover, according to this meter, there was consumed at the jail, during the month of November, 10,000 feet less of gas than during the month of October. These trifling eccentricities have so stirred up the supervisors that it is probable they will decide to have both the jail and the house of correction lighted by electricity. Representatives of two electric light companies went through the jail recently (let it be understood that they were both permitted to get out afterward), with a view to estimating the cost of fitting up the building. Jailer Jordans avers that comparatively little gas is burned in the jail, even in the jailer's rooms, which are so poorly lighted by the windows that on a cloudy day it is hard to read ordinary print in the rooms.

OUR BOSTON LETTER.

(From a special correspondent of the ELECTRICAL REVIEW.)

A. V. Bugbee, the wood engraver, has just finished a new cut of the complete Thomson-Houston factories at Lynn. It is a fine piece of work, and shows the factories, A B and C and also the two storehouses. The employes of the company at Lynn now number about 1,200 men and 200 women, and they have an aggregate floor space of three acres in which to accomplish their daily tasks. How well this work is done is shown by the output, which now reaches 40 machines and 600 arc lamps per week, and 1,400 incandescent lamps per day. The power is supplied by two 250 H. P. Greene engines coupled, and the enormous fly-wheel, 20 feet in diameter with a 38-inch face, is a marvel to behold as it gyrates at a speed of 100 revolutions a minute. The new factory is devoted entirely to the manufacture of alternating apparatus and motors.

The local Baxter Motor Agency has installed five motors the past week—one for a dentist, three for fruiters and stained glass manufacturers, and one to run a ventilator. The local papers have been discussing at length the horseshoe sharpening machine which has been spoken of in these columns in connection with the Baxter motors.

The American Waltham Watch Company are now in the market with their new American non-magnetic watch They will be on hand at the Pittsburgh Convention to meet all electric men and exhibit the watch and its advantages. An important announcement is made by the company that any Waltham watches in the pockets of the wearers will be refitted with the non-magnetic balance, hair-spring and escapement, which will make them in all respects equal, in regard to security against magnetism, to their new non-magnetic watches.

A pleasant informal meeting of the Electric Club was held Saturday evening at the rooms. Chairman Chapman, of the House and Entertainment Committee, had hit upon a novel plan for entertainment, and it was unfortunate he was unable to be present on account of illness, though his programme was ably carried out by Col. C. W. Ransom, the members present heartily joining in the spirit of the occasion. It is safe to assume that the results of so much original thought and research were never before made known in a single evening. A large attendance at the club dinner at the Thorndike on Saturday evening is assured, and Mr. Abbott's paper cannot but prove interesting and instructive. The special car for the Pittsburgh convention doesn't leave until 11 P.M., giving members of the club who are going, plenty of time to attend the dinner.

The Sawyer-Man Company have taken a contract for an isolated plant with 383 lights lights at the Murray Hall Hotel at Pablo Beach, Florida. The company are also putting in 250 lights at the paper mill of Wilder & Co., at Olcott Falls, Vermont, and an incandescent plant for the Boston Steam Power Company, in the rear of 22 Chauncy street, to run in connection with the arc lamp plant already established.

The Campbell line wire is being used entirely by the Wilson Police Signal people. The system has now been installed at the South End, and work is going on in Charlestown.

A Thomson-Houston motor is running some wood-sawing and chopping machinery at South Framingham. Mr. W. E. Woodward is in charge of the station there with Mr. S. O. Daniels.

The citizens of South Boston have petitioned the Legislature to grant some charter to any responsible parties to put in operation a general system of elevated railways for the city of Boston and vicinity.

Boston, Feb. 16, 1888.

Boston Personals.

Dr. Mason of the Simplex Company, left Saturday, and will not return until after the convention.

Just as many of Boston's scientific men are rushing off to Pittsburgh, there will be an influx of scientists working in a somewhat different direction—the American Institute of Mining Engineers, who meet here Feb. 21–25.

Prof. Norton, of the Institute of Technology, read an interesting paper on "Natural Gas" before the Society of Arts Thursday evening.

Mr. J. N. Pratt, the new general manager of the Jarvis Engineering Company, was in New York several days last week.

FIG. 9.—SECONDARY CIRCUIT—ENTERING FUSE BOX (COVER REMOVED.)

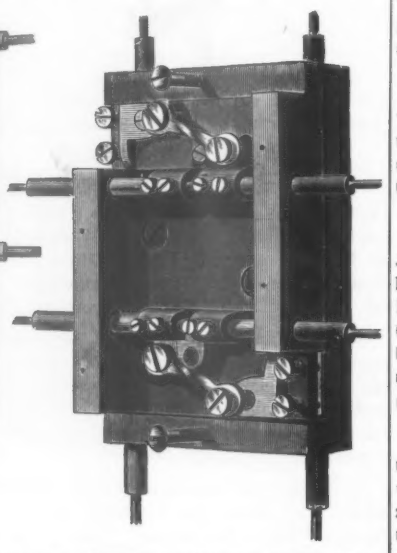


FIG. 10.—SECONDARY CIRCUIT DOUBLE HOLE FUSE FOR CLEAT WIRING (COVER REMOVED.)

J. English and wife are at the Adams House. Mr. English is largely interested in the electric light business at New Haven, Conn.

Among legislative incorporations last week was the following: J. A. Grout, president, F. S. Pearson, treasurer, the same and H. C. Buck, directors, as the Everett Electric Light Company; capital, $10,000.

FIG. 8.—CONVERTER.

Prof. Peabody, of this city, addressed the Boston Steam Fitters' Association Thursday evening on the elementary principles of heat and its application to steam.

E. G. Thomas and O. S. Hussey, both recent graduates of the Institute of Technology are in the Edison laboratory at Orange, N. J.

Among the declamations at the Chaney Hall exhibition in Music Hall, was one "How the Professor Roused his Horse" which will be remembered as Mr. C. J. H. Woodbury's tale which he so effectively related at the Electric Club's annual dinner.

Mr. S E. Barton, of this city, will read a paper at the Pittsburgh convention.

Boston, Feb. 13, 1888. T. W. S.

—— Manager C. W. Wiske, of the Amphion Academy, has not only the finest theater in Brooklyn, but has one of the best electrically-lighted places of amusement in the country. The Academy was opened a few weeks ago, the installation of an Edison incandescent plant of 1,100 lights being hurried to completion under the energetic management of Chief Engineer Field, of the Edison United Company. The regulation of the lights leaves nothing to be desired, and excellent taste has been displayed in the distribution of lamps and selection of electroliers. At the dome of the theater electric lamps, peeping through a painted sky, give a very realistic picture of the heavens; a ground glass shade lighted up, showing the moon about one-quarter full. The time not devoted to watching the stage, is generally given over to gazing at this ceiling picture, and as a result the theater-goers of East Brooklyn can now be recognized by the angle at which they carry their head.

—— Twenty-eight places of business in Hallowell, Me., are now lighted by the incandescent electric light; the works started up last week. In the spring the company will light some of the churches and residences. The company will have a 500-lamp dynamo, and will probably add the arc system at no distant day.

—— The Birmingham (Ala.) Edison Electric Illuminating Company will hold a meeting March 1 to consider: 1. Increasing their capital stock from $75,000 to $100,000; 2. Issuing not more than $30,000 of bonds; 3. Increasing the capacity of their plant.

Notes of the Edison Chicago Meeting.

When there is a convention of high mucky-mucks belonging to the supreme order of something or other, the hangers-on about a hotel soon discover some insignia by which to spot a delegate. In the Edison Convention at Chicago this particular mark was looked for in vain early during the first half day. It came, however, about ten o'clock, when almost every man in the Grand Pacific had a red-covered book sticking out of his outside coat pocket, and to him "it was a warning." By noon, these—which an old "jiner" said were rituals—had all disappeared. The lodge had been duly opened and was in order for business.

Thomas A. was buttonholed by all the "scientific" reporters of the daily press, and the way the interviewers garbled his utterances was enough to make him even deafer than he unfortunately is—to interviewers.

The man who could put his finger on Jenks between sessions, was considered a lively lightning man. So, too, of Vail. Both seemed to work at least twenty-four hours every day, and Steirenger was not far behind them. The Edison Convention means piles of work and much accomplishment.

Rather chilly reception weather was what the boys from the sunny South thought when they arrived at Chicago. Ten below zero on Wednesday, and five degrees better the next morning. Opposition companies would have struck a blizzard, meteorologically as well as metaphorically speaking.

The association was compelled to appoint a bouncer to keep out stragglers whose appearance seemed to smell of more than mere idle curiosity. Several were permitted to leave tracks—with the toes toward the door.

—— A stock company is to be organized at Athol, Mass., to put in both arc and incandescent plants, at a cost of $15,000, and it is arranged to take power from the cotton factory dam A few responsible individuals have taken half the stock and the other business men of the place are to be given a chance at the rest. It is believed that a sufficient number of arc lights to take the place of the street gas-lights can be put in and run for the price now paid for gas, and an informal canvass shows that there will be an immediate demand among large consumers for 600 or 700 incandescent lights out of the 1,000 which it is planned to furnish at first.

FIG. 11.—SECONDARY CIRCUIT.—SINGLE LIGHT FUSE FOR CLEAT WIRING.

—— Many members in the House at Washington afflicted with rheumatism go down to the engine room of the house and have Talcott, the electrician, give them a dose of electricity from his dynamo. John Clark, the clerk of the house, and S. B. Cunningham, the disbursing clerk, are regular patients of the electrical room, and go down daily to be treated. The electrical arrangements for the capitol are more elaborate than is generally supposed. The 1,500 five-feet gas burners by which the house is lighted, and the hundred or more jets in the rotunda, are all ignited by electricity. In addition to this there are numerous call bells from the hall to the speaker's rooms, and those of the chief stenographer and journal clerk, which are run by the same dynamo. The matter of lighting throughout by the electric light is being considered.

Alternating Current Motors.

Dr. Louis Duncan, of Johns Hopkins University, Baltimore, was a visitor to New York last Tuesday, and paid his first visit to the new club house of the Electric Club. In the evening he delivered an address before the Institute of Electrical Engineers on "Alternating Current Motors," which was most interesting and instructive, and will set a good many electrical investigators to thinking.

The lecturer concedes that there are very many and very grave difficulties in the way of a successful motor of the alternating character, and he gives them in detail in a very clear and intelligible manner. They are well worth careful consideration by all interested in this question of the development of a motor for the distributing circuits of those companies who supply alternating current either directly or through the operation of converters.

He divides the possible types of alternating current motors into four classes. First comes the plain series motor: the difficulty is in effecting rapid enough changes of magnetism in the masses of iron necessary to use in such a type. There are other difficulties as to starting and regulation. The next form is the Thomson type, in which the field magnets are excited by a peculiar operation of a generating circuit in the machine totally independent of the external circuit. This type of machine will start itself, but has a very low efficiency and a very limited range of power for the amount of material used in its construction. A third type is the self-exciting alternating current generator reversed, and this, again, has very grave objections in the way of successful and practical development.

Finally, the plan which the lecturer thinks is the best and most comprehensive of those possible, so far as he has been able to determine, is that in which the field is separately excited by a continuous current supplied from the central station by means of a special circuit used for that purpose alone, and carrying, say, ten per cent. of the total energy supplied. The motor could be readily started by the adoption of a secondary commutator on the motor shaft, and used only to get the motor up to speed by the continuous exciting current. When at speed, this special commutator would be thrown out of the starting circuit and its brushes lifted by the mere shifting of a lever, and the regular connections to the alternating circuit made by the same movement. This plan has very many points to commend it, and there seems to be no valid objection to it.

Altogether, the lecturer handled his most difficult subject in a way to show that he had given the various questions the most thorough study, and that he was perfectly familiar with all the obstacles that will beset the path of the constructor of alternating current motors.

The Oldest Pioneer.

At the introduction of gutta percha into this country, in the year 1847, Mr. W. W. Marks, the present efficient superintendent of the Bishop Gutta Percha Company, was secured to take charge of the new departure. Entering upon his duties on the 5th day of February, he therefore completes this year forty consecutive years in the manufacture of the above named valuable article as a perfect insulation. Previous to assuming control of the manufacturing interests of Mr. Samuel C. Bishop, Mr. Marks was engaged in the production of india rubber fabrics, and the experience and knowledge gained greatly benefited him in the designing and erection of improved machinery for preparing the gutta percha, previous to its use as a covering for telegraph wires.

As superintendent of the works under Mr. Bishop, he continued until that gentleman's death in 1872, when he became the sole manager, retaining this position for a period of thirteen years. At first, the only goods made were belting, pipes, shoe soles, etc., which were sold in large quantities, gutta percha then costing about fifteen cents. Since then it has been principally used as an insulation for electrical wires, and the increasing demand necessitated the most improved machinery, which, through the ingenuity of Mr. Marks, was produced from time to time, until now the finest and only machines of their kind are in constant use.

A very valuable invention of his is "Marks' Compound," an acid-proof covering for battery copper wires, which has no equal and is sold in large quantities.

Mr. Marks has the proud distinction of being longer connected with the insulation of wires with gutta percha than any person living, and many pleasant incidents can he recite, and many were the inducements made to connect himself and workmen with others but preferred to remain with the only and original manufactory in America of gutta percha.

—— The National Pipe Bending Company of New Haven, Conn., manufacturers of the National feed-water heater, have recently placed an 800 horse power heater, in the Edison station at Boston; an 800 horse power heater in the new electric light station at Grand Rapids, Mich. The company has also just sent an 100 horse power heater to an electric light company on the Pacific coast, and are building a 400 and a 500 horse power heater. Over 70 heaters for electric light companies were sold by this company last year.

FIG. 12.—WALL SWITCH.

FIG. 13.—WALL SOCKET.

SECONDARY CIRCUIT.

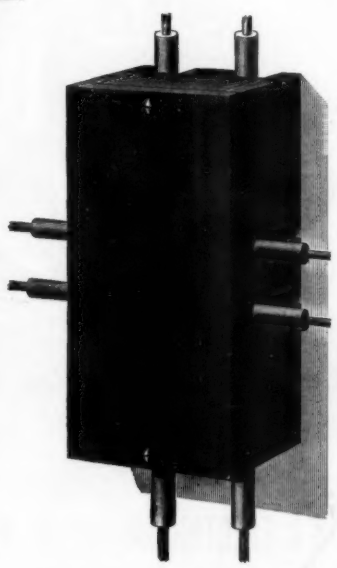


FIG. 14.—SECONDARY CIRCUIT—DOUBLE POLE FUSE MOLDING WIRING.

FIG. 15.—SINGLE LIGHT FUSE AND LAMP FIXTURES COMPLETE.

—— The Hartford Dynamic Company of Hartford, Conn., have this last week installed a Russell engine of 90 horse power for the Hartford Electric Light Company's new station. It is running two Thomson-Houston 500 light incandescent dynamos, and as the company is moving into their new station the engine is only stopped 10 minutes in the 24 hours for oiling.

—— The high school and academy faculty of Elgin, Ill., through the courtesy of Mr. Geo. A. Bowen, were recently privileged visitors to the Elgin Electric Light Company's works. The visitors took great interest in all they saw, and were well entertained by the remarks of Mr. Bowen and engineer J. H. Risdon.

—— The gas and electric light combination is making satisfactory progress in New England. One of the most recent converts to this system of mixed lighting is the Pawtucket Gas Company, of Pawtucket, R. I., the general manager of which, Mr. Stiness, is laying out to do a large amount of electric lighting in connection with his gas industry. He is building one of the finest stations in New England, and has adopted the American system, which is now being installed.

—— It is stated that the Thomson-Houston Electric Company is to assume control of the plant of the Cambridge, Mass., Electric Light Company.

—— The firm of Bundy, Tompkins & Fassett, Elmira, N. Y., have closed a contract with C. C. Sutherland, representing the Brush Electric Company of Cleveland, for a complete plant with which to light their block on Carroll street, and also the large store lately occupied by W. W. Fish, and soon to be opened by Dey Brothers & Co. One hundred lights are to be used, the plant to be ready in two weeks.

—— The Great Barrington Electric Light Company, Great Barrington, Mass., has been incorporated. Capital stock, $16,000. D. Ward Northrup, and others, incorporators.

—— The electric light company at Palmer are laying out the ground for a building 50 by 80 feet on the lot recently bought of Mr. Converse, near the New London Northern railroad's old depot, for a plant which will supply Palmer and Monson, and they hope to get some lights into Thorndike, Bondville, and Three Rivers. Work will be pushed as rapidly as the weather will permit.

—— The Medford Electric Light Company has been incorporated, with a capital of $20,000. W. H. Warren is president, J. H. Hooper, treasurer; the same and J. S. Sturtevant, W. C. Craig, H. C. Buck, F. S. Pearson and C. H. Loomis, directors.

—— Bucksport, Maine, now seems almost certain to have the electric light, arrangements now being in progress which will establish it there soon. Mr. George H. Grant, of Bar Harbor, has hired the old steam mill belonging to Edward Genn, and will put in a dynamo which will light the town thoroughly.

The Detroit "Free Press" on the Electric Club.

The opening of the Electric Club in New York has marked an era, says the Detroit *Free Press*. It has marked various other things, but principally an era. You can tell a member of the Electric Club the moment you meet him, for he, like the era, is marked. The doors of the club are so arranged that the moment you press a button the door will fly open. The projectors forgot that somebody might be on the other side of the door, and the consequence is that hardly a member has escaped being knocked down by a suddenly opening door. There is hardly a nose in the club which is not more or less out of repair.

The electrical foot-warmer has been a success, but the same cannot be said for the boot-blacking arrangement. One of the members got it started and forgot the combination. Before it could be hauled off it had used up a nice pair of shoes, had ruined the stockings, and was polishing off his corns when help arrived.

Still, taking it all around, the electrical institution has more than fulfilled the anticipations of its projectors.

This being the case, Detroit capitalists have put their heads and their cash together and have resolved to establish an electric restaurant, which is sure to be a great success.

The plans, which we have carefully examined, promise something absolutely unique in the way of restaurants. There will be no waiters, no cashier, no cooks, nothing, in fact, that a food consumer usually sees in an eating house, and consequently there will be an entire absence of many aggravating accompaniments to a meal which have been suffered simply because it is against the law to slaughter a waiter when he most deserves it.

The way it will work is this: A man sits himself down at a table, and picks up the bill of fare. The price of every article is marked. He puts a fifty-cent piece in the electrical machine, and gets fifty cents back in five-cent bits. Steak, say, is twenty-five cents. He drops five of the coins in the slit beside the steak button, presses the latter and the steak is turned on below. An indicator shows how the cooking advances, the dial being marked from "very rare" to "cinder." At the proper moment he presses the delivery button, and the steak comes up through a trap door on the table, after the fashion of the clown in the pantomime, only the steak comes up on a hot plate, which the victim reaches for and drops the moment he touches it. In a similar manner the guest calls for potatoes, bread, butter, coffee and all the rest, taking care to drop the necessary number of nickels into the slits beside the respective buttons. When he finishes his meal he rings as he would at a telephone when he is through talking. Then a man at the central office turns on a current and the dishes disappear, leaving the table ready for the next comer.

The Electrical Restaurant Company (Limited) will have a central office, with engines, dynamos, etc. They will establish restaurants at various parts of the town, and it is expected that the fact that they have no waiters will alone give them a handsome profit.

Thus electricity has learned to labor and to wait, as the poet puts it.

—— An electric lighting company has been organized at Williamstown, Mass., by C. M. Smith, Keyes Danforth, T. M. Quinn, C. S. Cole, and Fred C. Severance. Mr. Cole has been elected president, Mr. Danforth vice-president, and C. M. Smith clerk and treasurer, and these officers will constitute the board of directors. No plant will be put in until spring.

—— The temporary injunction granted the gas company of New Orleans, restraining the electric light company from erecting its poles and towers, has been dissolved, and the work of fitting up the towers will be resumed at once.

ELECTRICAL PATENTS

(Copies of any Patents in the following List wil be sent to any address on receipt of twenty-five cents.)

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING FEB. 7, 1888.

377,374 Telegraphy; Thomas A. Edison, Menlo Park, N. J., assignor to the Western Union Telegraph Company, of New York.

377,383 Electro-magnetic grain-weighing scale; William A. Holley and Ulrik Malin, Holland, Mich.

377,397 Electric railway; Washington I. Ludlow, Cleveland, Ohio.

377,409 Embroidering machine; Roswell T. Smith, Nashua, N. H., assignor to himself, Nate W. Goddard, same place, and George H. Dunham, New York, N. Y.

377,413 Electrical apparatus for effecting mechanical movements; Roswell T. Smith, Nashua, N. H.

377,441 Transfer switch and circuit for telephone exchanges; Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place.

377,475 Telephone transmitter; John F. Babr, Jersey City, N. J.

377,487 Process of electrolyzing copper; Edward S. Hayden, Waterbury, Ct.

377,488 System of electrical distribution; John W. Howell, New Brunswick, N. J.

377,505 Electric gas-lighting burner; Le Roy S. White, Waterbury, Ct., assignor to the Electrical Appliance Manufacturing Company, same place.

377,518 Magnetic separator; Thomas A. Edison, Llewellyn Park, N. J.

377,538 Electric circuit closer; 377,539 Electric bell; William F. Stocker, Eureka, Kan., assignor to William H. Byers, same place.

377,553 Electric gas lighter; Julius Finck, San Francisco, Cal.

377,591 Automatic grain-weighing apparatus; Edwin R. Whitney, St. Johnsbury, Vt., assignor to the Standard Electric Company, of Vermont, same place.

377,612 Telephone transmitter; Hammond V. Hayes, Cambridge, Mass.

377,615 Electric arc lamp; Edward E. Higgins and John James, St. Johnsbury, Vt., assignors to the Standard Electric Company, of Vermont, same place.

377,622 Electric motor car; Walter H. Knight, New York, N. Y.

377,626 Electric mechanical signal apparatus; William W. Le Grande, Louisville, Ky., assignor to the Le Grande Signal and Electrical Company, same place.

377,634 Railway signal; Thomas S. Nicholson, Mount Washington, Ohio.

377,642 Secondary battery; John S. Sellon, Hatton Gardens, County of Middlesex, England, assignor to the Electrical Accumulator Company, of New York.

377,683 Armature for dynamo electric machines. 377,684 Electro-mechanical movement; Richard H. Mather, Windsor, Conn.

PATENTS.

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Brush Electric Co., Alex. Kempt, Special Agent.
Excelsior Electric Co., C. J. Reilly, Western Mgr.
Sperry Electric Light Motor & Car Brake Co., 201 Royal Insurance Building
J. H. Reid, General Manager of the Mather Electric Light Co., Chicago.
Wm. H. Purdey, Comm. of Public Works, Chicago.
John Mab, Chief Engin'r of Board of Trade, Chic.
C. J. Melmes, Gen'l Sup't Thomson-Houston Light, Omaha, Neb.
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